FAVOURITE FLOWERS

OF

GARDEN AND GREENHOUSE

LÆLIA PURPURATA

Flower Nat. size

VOL. IV.—Front.

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1897
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FAVOURITE FLOWERS

OF

GARDEN AND GREENHOUSE

BY

EDWARD STEP, F.L.S.

THE CULTURAL DIRECTIONS

EDITED BY

WILLIAM WATSON, F.R.H.S.
ASSISTANT CURATOR, ROYAL GARDENS, KEW

ILLUSTRATED WITH

Three Hundred and Sixteen Coloured Plates

SELECTED AND ARRANGED BY

D. BOIS
ASSISTANT DE LA CHAIRE DE CULTURE AU MUSÉUM D'HISTOIRE NATURELLE DE PARIS

VOL. IV

Mo. Bot. Garden
1897.

LONDON
FREDERICK WARNE & CO.
AND NEW YORK
1897

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FAVOURITE FLOWERS

OF

GARDEN AND GREENHOUSE

NORFOLK ISLAND PINE

Natural Order Coniferæ. Genus *Araucaria*

Araucaria (from *Araucanos*, the native name of *A. imbricata* in Chili). A small genus of noble evergreen trees, with small persistent scale-like leaves, which are flattened, pointed, stiff, and usually overlapping. The spreading branches are arranged in whorls. The sexes are in separate flowers: the males in terminal cylindrical spikes, each anther divided into a number of cells; the females in cones. The latter when ripe are large and globular, covered with overlapping woody scales, some barren, others bearing a single seed. There are about seven species, natives of South America and Australasia.

History. With Conifers as *trees* we have little concern in this work, but *Araucarias* more than any other genus of the group lend themselves to pot or tub cultivation in greenhouses and conservatories, in a young condition. They are all of modern discovery and introduction. *A. imbricata* was introduced from Chili in 1792 by A. Menzies, to whom the nuts were offered as dessert. He put a few of them into his pocket and brought them to Kew. *A. excelsa*, the Norfolk Island Pine, was sent to Kew by Governor Phillips, of New South Wales, in the year 1793. In 1819 *A. brasiliana* was introduced from mountain districts of Southern Brazil. About 1826 Allan Cunning-

ham discovered the Moreton Bay Pine in Queensland, and sent specimens to Kew, where one of the batch may still be seen; Aiton named it *A. Cunninghamii* in honour of the discoverer. Another Queensland species, the Bunya Bunya, was brought to England in 1846 by Mr. T. Bidwill of the Sydney Botanic Gardens, and named *A. Bidwillii* by Hooker. In 1851 *A. Cookii* was introduced from New Caledonia, and from the same island came *A. Balansæ* in 1875.

Principal Species.

ARAUCARIA BALANSÆ (Balansa's). Trunk 130 to 160 feet high, with plumy branches, and overlapping oval-triangular, curved leaves. Small specimens make beautiful pot-plants for the greenhouse.

A. BIDWILLII (Bidwill's). Bunya Bunya. Trunk 150 feet high. Leaves leathery, oval-lance-shaped, curved, in two nearly horizontal rows. Cone as large as a man's head. Greenhouse plant of very symmetrical habit.

A. COOKII (Cook's). Trunk about 200 feet high. Leaves awl shaped, densely overlapping the branches. This species has the habit of shedding its lower branches when they have attained to a fair size, and replacing them by a smaller, more bushy growth. Also known as *A. columnaris*. Greenhouse.

A. CUNNINGHAMII (Cunningham's). Moreton Bay Pine. Trunk about 100 feet high. Lower branches spreading horizontally, upper ones taking an upward direction. Leaves needle-shaped, somewhat square, rigid. There is a var. *glauca*, with silvery glaucous leaves. These are greenhouse plants, but the type is hardy near the south-west coasts of England.

A. EXCELSA (lofty). Norfolk Island Pine. Trunk 150 feet high and 20 feet in circumference. Branches frond-like, horizontal or drooping. Leaves curved, needle-shaped, sharp-pointed, densely packed. This is the most desirable of the genus in a young state. There are several good varieties, of which the best are *goldieana* and *sanderiana*. Greenhouse or conservatory. Plate 235.

A. IMBRICATA (overlapping). Monkey Puzzle, or Chili Pine. Trunk 50 to 100 feet high. Branches spreading with downward tendency, but the tips ascending. Leaves oval-lance-shaped, leathery, stiff, somewhat keeled, sharp-pointed, concave, shining; in whorls, closely overlapping. Hardy.

Cultivation.

Young *Araucarias* are among the most graceful of those greenhouse plants that are cultivated for beauty of form apart from flowers. For this purpose it is best to keep up a succession of small plants in pots, which will also allow of their occasional

NORFOLK-ISLAND PINE

(ARAUCARIA EXCELSA)

Reduced

PL. 235

use for table decoration. They should be potted in a compost of fibrous loam, leaf-mould, and sand. Propagation is effected by cuttings and seeds. Seeds should be sown in sandy soil and subjected to slight heat. Patience is required for this method of propagation, as the seeds may be very tardy in germinating. Cuttings are made from lateral shoots, the production of which is induced by stopping the main shoot. These are inserted firmly in pots of sandy soil, and placed in a close frame kept at a temperature of about 60°. Cuttings made from the horizontal branches never make symmetrical plants. They must be watered with care, and the pots must be efficiently drained. Seeds of *A. excelsa* are now often imported in large quantities, so that cuttings are rarely resorted to. This species is grown by tens of thousands by the Ghent nurserymen, who supply nearly the whole of Europe with healthy young plants at a cheap rate. *A. imbricata* is also raised from seeds. The others are not much grown in this country. When grown in rooms the plants are apt to get covered with dust; this can be removed by syringing them vigorously with soapy water. Care must be taken not to bruise any of the shoots, more especially the leader, as parts so affected rapidly perish.

Description of Plate 235. *Araucaria excelsa*, the Norfolk Island Pine, greatly reduced.

FERN PALMS

Natural Order CYCADACEÆ. Genus *Cycas*

CYCAS (the classical Greek name for some species of Palm). A genus of about fifteen species of stove herbaceous perennials, which agree with Conifers in possessing no ovary, the ovules being naked and receiving the pollen directly without the pollen-tube having to penetrate stigma and style. Cycads differ from Conifers chiefly in the fact that branching of the stem is a very rare occurrence with them, and in having large frond-like leaves. The stem is thick and succulent, except in very old plants. The leaves of *Cycas* are of two kinds: small, dry, brown, hairy, leathery, stalkless scales, and large, stalked, pinnate foliage-leaves. The two kinds alternate periodically. An individual produces at its summit either male or female flowers; not both. The female flower is a rosette of foliage-leaves which have undergone slight modification in development, the lower leaflets (*pinnæ*) being replaced by ovules as large as a moderate-sized plum, coloured orange-red when mature. These grow to full size whether fertilised or not. In the male the inflorescence is

cone-like, the staminal leaves are much smaller, undivided and furnished on the under-side with a number of densely-crowded pollen-sacs. The species are natives of Tropical Asia and Australia.

History. Cycads are of comparatively recent introduction, *Cycas circinalis* having been introduced from the East Indies in the year 1700. The name of Sago Palm, sometimes applied to these plants, is somewhat misleading, as they do not produce real Sago of commerce, which is obtained from species of true Palms, viz. *Metroxylon*. The name arises from the fact that from the seeds of *C. circinalis* in the Moluccas, and the stem of *C. revoluta* in Japan, a starchy substance is derived which is used as food; *sago* or *sagu* being the Papuan word for bread. *C. revoluta* was introduced from China in the year 1737. These are the species principally cultivated in this country, but other good forms have been introduced, and may occasionally be seen in our stoves, such as *C. media* from Northern Australia, 1874, *C. normanbyana* from New South Wales in 1875, and *C. siamensis* from Cochin China, 1878.

Principal Species. C. CIRCINALIS (curved-leaved). Trunk 6 to 20 feet high, sometimes branched. Leaves smooth, paler beneath, 6 to 9 feet long; leaflets sickle-shaped, 6 to 12 inches long. Ceylon, etc.

C. MEDIA (medium-sized). Trunk stout, becoming tall when very old. Leaves large, pinnate, 3 to 6 feet long; leaflets very numerous and very slender, the lower ones passing into spines.

C. NORMANBYANA (Normanby's). Trunk slender, base of leaf-stalks covered with scurfy down. Leaves 2 to 4 feet long; leaflets very slender and numerous, touching each other, about 6 inches long.

C. REVOLUTA (rolled back). Trunk very stout; in old specimens sometimes branched at top, 6 to 9 feet high. Leaves 2 to 6 feet long, dark green; leaflets numerous, narrow, the margins rolled back.

C. SIAMENSIS (Siamese). Trunk stout. Leaves 2 to 4 feet long, pinnate; leaflets narrow-lanced-shaped, with an abrupt spiny point. Closely resembling *C. circinalis*.

Other genera of Cycads grown in stoves are *Macrozamia* and *Bowenia* from Australia, *Zamia* and *Dioon* from South and Central America, *Encephalartos* and *Stangeria* from Africa. Many of these are excellent subjects for large conservatories. *Bowenia* is remarkable for its tuberous stem and bipinnate leaves, and *Stangeria* for its close resemblance to a fern. The cones of *Macrozamia* and *Encephalartos* are very large and handsome. There is a fine collection of these plants in the large Palm-House at Kew.

Cultivation. Cycads should be planted in pots or tubs of rich loam to which river sand has been added in sufficient quantity to

MASDEVALLIAS

(*A*, 1) M. COCCINEA — Plant: Nat. size

(*B*) M. GEMMATA — Nat. size

(*C*) M. CHIMÆRA — ½ Nat. size

render the soil fairly open. It is necessary that these receptacles should be efficiently drained, as the plants are impatient of stagnant moisture. They are raised from seeds germinated in the stove; but occasionally suckers are thrown up round the base of the old plants, and these may be removed and potted separately, affording vigorous young plants. There is no very great difference in the habit and appearance of the species, and either of them will be found a distinct addition to the stove, and to the conservatory when removed thither in summer. *C. revoluta* is sufficiently hardy to be turned out about May, and the pot or tub sunk in the border in a sheltered, sunny position. The stems of all Cycads will strike root readily, so that plants that have grown too tall may be lowered by cutting off their heads at the desired height, and inserting them in sandy soil in a stove.

ORCHIDS

Natural Order Orchideæ

A large Natural Order, comprising three hundred and thirty-four genera and about five thousand species of herbs, with roots in bunches from the base or tuberous. Many of the tropical species grow upon the trunks of trees, and are hence called *epiphytes*. They have true stems (*Vanda*), or modified stems (*Dendrobium*), or pseudo-bulbs (*Odontoglossum*), or rhizomes (*Phaius*), or the leaves are sessile on a tuft of fleshy roots or tubers (*Cypripedium, Orchis*). The flowers are either solitary or clustered in spikes, racemes, or panicles; and of singular shapes and structure. The perianth consists of six irregular, coloured segments, of which the three outer are sepals, nearly alike, as also are the two lateral members of the inner series (petals), but the central one of this series is dissimilar, usually larger, and often ends in a spur. By the twisting of the ovary, the flower is turned upside down, and this large central petal, which should be at the upper side of the flower, becomes a lower lip (*labellum*). The stamens and the style are welded into an unsymmetrical mass, the *column*. The upper part of this column supports the single anther (in the genus *Cypripedium* there are two anthers), which is two-celled. The ovary is usually long, and one-celled, the style often ending in a thickened process called the *rostellum* or beak, below and in front of the anther or between its cells, and the stigma is a sticky surface below the *rostellum*. The pollen-grains are each attached by an elastic thread to a stalk (*caudicle*) which ends in a basal gland. In this way two, four, or eight pear-shaped

masses (*pollinia*) of pollen are formed. With very few exceptions the essential organs are so placed as to prevent fertilisation unless assisted by some agency such as bees, birds, etc. The fruit is three-valved; the seeds exceedingly numerous, spindle-shaped, but minute. To facilitate reference to so large a number of genera, they are grouped into five tribes according to their affinities: I. Epidendreæ, II. Vandeæ, III. Neottieæ, IV. Ophrydeæ, V. Cypripedieæ; and these are each divided into sub-tribes.

It will be understood that so vast an Order, with its hundreds of genera and thousands of species, of which it is reckoned one-half have been brought under the care of the gardener, cannot be dealt with in a work like the present in any but the most superficial manner. We can only hope to take representative species from a few of the principal genera, and with the aid of the plates give a slight notion of their beauty of form and colour, and the wide variation of structure based upon the general characters enumerated above.

History.

Orchid-culture must be reckoned among the most modern developments of the horticultural art. The first exotic species grown in Britain was probably *Bletia verecunda*, introduced to Kew from the Bahamas by Mr. Peter Collinson in 1731, succeeded at a distance of forty-seven years by Dr. Fothergill's importation of *Phaius grandifolius* from China. Between these dates, however, *Vanilla planifolia* was introduced (some years prior to 1739), lost, and reintroduced early in the nineteenth century. When Aiton published the first edition of the *Hortus Kewensis* in 1789 he could only enumerate fifteen foreign species of Orchids as in cultivation at Kew; the Hand-list of Orchids cultivated at Kew, issued in 1896, enumerates 1800 species, belonging to 190 genera. A century ago the prevailing notion concerning the epiphytal species was that they were parasites requiring each its special species of tree for successful growth, and that all, or most, foreign orchids were natives of tropical jungles requiring a hot, humid atmosphere, with absence of ventilation. Mr. H. J. Veitch, F.L.S., a few years ago contributed to the proceedings of the Royal Horticultural Society a most interesting paper on "Orchid Culture, Past and Present" (*Journal R. H. S.*, vol. xi. p. 115), in which he describes the struggle with error the Orchid-grower has had to fight until recently. Collectors sent home plants without taking care to describe the conditions under which they found them growing naturally; eminent traders and others abroad gave information based on insufficient data or a lack of data, and so fixed the wrong kind of treatment for half a century, during which period great numbers of plants were imported, and as regularly killed with the best intentions. Mr. Veitch says: "The usual

DENDROBIUM NOBILE

Nat. size

PL. 237

treatment of Orchids at this period was to pot them in a mixture of loam and peat, and keep them constantly plunged in the tan-bed of the stove." No particular allowance seems to have been made for differences in the genera or species, or the altitudes at which they grew in nature.

Early in the nineteenth century Messrs. Loddiges of Hackney began to grow Orchids in earnest, and soon after, in the year 1812, they had brought to them a specimen of *Oncidium bifolium* by the gentleman who had brought it from Monte Video; but when he told them it had been hung up in his cabin without earth and had flowered during the greater part of the voyage, he was considered to have relationship with Munchausen and Mandeville. However, the epiphytal Orchids, as the known species became more numerous, got the general title of "air plants," and the scientific appellation of *Epidendrums*; but they were regarded merely as curiosities, and it was only here and there that a specimen was induced to flower. The gardeners who accomplished this were clever men, and one of the first was Mr. Fairbairn at Claremont, who in 1813 flowered *Aërides odoratum* by placing it in a basket of spent tan and moss, hung in the Pinery, and dipped in a bucket of water half a dozen times a day. About fifteen years later Sir Joseph Banks suspended epiphytes in cylindrical wicker-baskets with a little vegetable mould and moss, and thus may be said to have invented the idea of the modern Orchid-basket. Mr. Veitch's account of the Messrs. Loddige's method at that date will be of interest to Orchid-amateurs of to-day: "Loddiges at this time made their compost of rotten wood and moss, with a small quantity of sand. Their orchid-stove was heated by brick flues to as high a temperature as could be obtained by that means, and by a tan-bed in the middle kept constantly moist by watering, and from which a steamy evaporation was rising at all times without any ventilation from without. Their method was, of course, imitated by probably all cultivators. To these hot steamy places Orchids were consigned as soon as received, and into which, it was occasionally remarked, it was as dangerous to health and comfort to enter as it was into the damp, close jungle in which *all* tropical Orchids were then supposed to have their home."

Except that he stipulated for good drainage, this was practically the system prescribed by Dr. Lindley, who was for many years the high priest of horticulture, and whose precepts and practice dominated almost every garden throughout the country, with the result that, as Sir Joseph Hooker has remarked, England was for half a century the grave of tropical Orchids. For the stream of imports still continued, and wealthy amateurs and trade-growers sent out their own collectors, who not only

sent home Orchids, but also remonstrances against growing (or attempting to grow) them under conditions so different from those under which they were found. These remonstrances, joined to an increasing knowledge and intelligence in the gardeners, gradually led to the abandonment of the old system. Hot-water pipes were substituted for the brick flues, a lower temperature was maintained, fresh air was admitted, more perfect drainage ensured, and a moist atmosphere obtained by sprinkling the paths and staging. This was the treatment adopted by Paxton at Chatsworth, and which gradually, after many years of clinging more or less fully to the "orthodox" teaching of Lindley, found its way into the Orchid-houses of the land, with the result that most epiphytes can now be flowered with perfect success. Some still puzzle the most successful growers, such as *Cattleya citrina*, *Diacrium bicornutum*, some *Dendrobiums*, *Catasetums*, and Mexican *Oncidiums*, yet in certain establishments one or other of these is flowered successfully. Thus *Diacrium bicornutum* gives little difficulty at Kew, and Sir Charles Strickland has grown *Cattleya citrina* successfully for fifteen or sixteen years in an ordinary greenhouse.

Among the firms that followed the lead of the Loddiges in growing Orchids for sale were: Rollison, Veitch, Low, Williams, and Bull, in London; Maule of Bristol, Backhouse of York, and Sander of St. Albans, —the last-named with three acres of greenhouses devoted exclusively to Orchids. Perhaps the most striking testimony to the knowledge brought to bear upon Orchid-culture in the last fifty years is to be found in the fact that hybrids "made in Britain" are becoming plentiful. As early as the year 1852 Mr. John Dominy entered upon a course of experiments in hybridising in the Exeter nurseries of Messrs. J. Veitch & Sons. His first hybrid, *Calanthe Dominii* had *C. masuca* and *C. veratrifolia* for parents, and was raised in the following year, but did not flower until 1858. Among other good things associated with Mr. Dominy's name are *Calanthe Veitchii*, *Cattleya exoniensis*, and *Lælia Dominii*. Mr. Seden, a pupil of Dominy's, has carried out similar work with success in Messrs. Veitch's Chelsea nurseries, and there are now numerous establishments in which the breeding of Orchids artificially is an important industry. Hundreds of hybrid *Cypripediums*, *Cattleyas* and *Dendrobiums* have already been raised, and numerous other genera have been operated upon by the hybridiser with success. The bulk of the plants, however, are imported direct from their native habitats.

Much more might be said relating to the history of Orchids as cultivated plants, but exigencies of space forbid. We must content ourselves with a glance at a few typical genera.

DENDROBIUM FARMERI, *var. aureoflavum*

Nat. size

PL. 238

MASDEVALLIAS

Natural Order ORCHIDEÆ. Genus *Masdevallia*

MASDEVALLIA (named in honour of Dr. Masdevall, a Spanish botanist). A genus of about one hundred and fifty species, mostly small, growing in moss on the trunks of trees, or in crevices of the rocks, in the cool mountain forests of Tropical America, chiefly from Peru to Mexico, and at elevations between 6000 and 9000 feet. They have creeping root-stocks with spoon-shaped or strap-shaped leathery leaves, and large or medium-sized flowers of singular form, borne singly or several together on a tall slender scape. The sepals are united to form a tube, except at their upper ends, which are prolonged into slender tails, in some species of great length. The petals are small and hidden in the sepal-tube, the *labellum* hinged to the half-rounded column.

History. The growing of *Masdevallias* in this country is a thing of yesterday and to-day. Botanists were acquainted with herbarium specimens of a number of species long before a living plant was brought to Britain. This was due to the difficulty of transporting them to the coast without destroying them. Growing in a moderate temperature at so great an altitude, their long journey down would subject them to an increasingly higher temperature, so that the bulk of a consignment would be worthless before it reached this country. It was therefore necessary that some amount of cultivation and propagation should be practised here before many plants could be obtained. But, only quite recently, the demand was even smaller than the supply, because those first introduced were by no means the most attractive members of the genus. Among these were: *M. infracta*, introduced from Brazil, 1835; *M. triangularis*, from Columbia, 1842: and *M. floribunda*, from Mexico, 1843: *M. tovarensis* came from Venezuela, 1865: *M. veitchiana*, from Peru, in 1867; *M. ignea*, from Columbia, in 1871: and the principal species now cultivated have been introduced since that date. *M. muscosa* is so sensitive that upon a fly or other insect, however small, alighting upon the labellum or column, the labellum shuts up over the column and compels the insect to pass first over the stigmas and be made sticky on its lower surface, then over the pollinia, when pollen-grains adhere to it. On the fly visiting another flower, these are detached by the stigma, and so effect cross-fertilisation.

Principal Species. In the following descriptions only the flowers are described, except where the leaves appear to depart suffici-

ently from the general type prevailing in the genus. The height refers to the flower-scapes.

MASDEVALLIA AMABILIS (lovely). Free-flowering, orange-scarlet, 6 inches high. Introduced from Columbia, 1874.

M. BELLA (charming). Flowers large; upper sepal spotted with dark purple-brown, its base ochre-yellow; inner half of lower sepals yellow, outer half and long tails dark purplish brown. Introduced from Columbia, 1878.

M. CAUDATA (tailed). Flowers long-tailed, streaked with purple, green, and yellow; 4 inches high. Introduced from Columbia, 1874. Also known as *M. Shuttleworthii*. The var. *xanthocorys* has the upper sepal almost yellow, streaked with brown.

M. CHELSONI (Chelsea). Flowers white, the fiddle-shaped labellum marked with brown and mauve. A garden hybrid, raised 1880 from *M. veitchiana* and *M. amabilis*; believed to have been the first raised from seed in Europe.

M. CHIMÆRA (Chimæra-like). Leaves narrow-lance-shaped, 6 to 9 inches long. Sepals yellow with close mottling of dark red, and clothed with hairs; triangular, each tapering to a very slender and very long tail; total length of sepal, 10 or 12 inches. Native of Columbia. Plate 236C. Several good varieties are in cultivation, among them *backhouseana* (1879), with larger flowers of brighter tints; *Roezlii* (1880), a handsome plant with blackish purple sepals, and light mauve petals and lip.

M. COCCINEA (scarlet). Sepals yellow without, bright scarlet within; upper one narrow. Winter-flowering. Introduced from Columbia. Plate 236A, fig. 1. Several good varieties are grown, including *Lindeni* (also known as *Harryana*), in which the sepals vary from brilliant violet to rose and magenta. Introduced 1869.

M. GEMMATA (adorned). Leaves obscurely three-toothed at apex. Upper sepal ochreous, triangular, with a tail of equal length; lower sepals purple with ochreous base and orange tails. Lip heart-shaped, purple. Introduced from Columbia, 1883. Plate 236B.

M. IGNEA (fiery). Leaves oblong on long foot-stalks. Flowers exceedingly brilliant, of a dazzling fiery red, sometimes shaded with crimson or violet-rose; upper sepal narrow, tapering gradually to a long tail, and bent close over remainder of flower. Height 6 inches. Introduced from Columbia, 1871. The var. *marshalliana* has yellow flowers.

M. MELANOPUS (black-stalked). Flowers white with purple dots and yellow tails; 6 inches high. Introduced from Peru, 1874.

M. MUSCOSA (mossy). Flowers yellowish, with reddish nerves; lip

CATTLEYA MOSSIÆ

Nat. size

PL. 239

deep violet, bearded, and irritable; stalks bristly. Introduced from Columbia, 1885.

M. POLYSTICTA (many-dotted). Flowers white, spotted with dark crimson; scapes six- to eight-flowered, 6 inches high. Introduced from Northern Peru, 1874.

M. ROSEA (rosy). Flowers rosy-purple, 2 inches long. Introduced from Peru, 1880.

M. SCHLIMII (Schlim's). Flowers yellow, mottled with brownish red; scape three- to six-flowered. Leaves 6 to 12 inches long; scapes as long again. Introduced from Venezuela, 1884.

M. TOVARENSIS (native of Tovar, Columbia). Flowers pure white, usually in pairs; scape 6 inches high. Introduced from Columbia, 1865.

M. VEITCHIANA (Veitch's). Flowers; outside tawny-yellow, inner surface rich orange-scarlet, studded with purple-tipped woolly glands. Introduced from Peru, 1867. The var. *grandiflora* has much larger flowers.

Culture. *Masdevallias* are among the most easily accommodated of Orchids. Owing to their natural habitat being at so high an elevation they require to be grown in a cool, moist atmosphere in small pots, with a compost of peat and sphagnum, and a good depth of drainage. During the summer they must be kept shaded from the sun, and as cool as possible; in winter they require a temperature not lower than 50°. Air should be admitted at all times, avoiding cold draughts, and they must have plenty of water during the growing period; less when at rest. They should be repotted in February. Thrips and red spider often disfigure the leaves, and slugs eat the young leaves and flower-stems; they must be kept under.

Description of Plate 236. *Masdevallias.* A, *M. coccinea*, much reduced. The Fig. 1 shows the flower of the natural size; 2 is the column: and 3 the pollinia. B, *M. gemmata*, about one-third less than the natural size. C, *M. Chimæra*, half the natural size.

DENDROBES

Natural Order ORCHIDEÆ. Genus *Dendrobium*

DENDROBIUM (Greek *dendron*, a tree, and *bios*, life: in allusion to their epiphytal habit). An extensive genus (three hundred species) of stove and greenhouse plants. There is considerable difference among the species, some having wiry creeping rhizomes, some with small conical

pseudo-bulbs, others club-shaped, horny stems, leafy only at the summit; but the majority produce long leafy branches. The majority, again, have ordinary flat leaves, but in some they are two-edged, like those of *Iris*, and in others they are round and tapering. Some of the species are minute, others are among the largest of the Orchids. The flowers are purple, rosy, green, or yellow; solitary or in clusters or racemes. The lip is more or less contracted at the base, and lies upon or grows to the foot of the column. The anther is two-celled, with four pollinia of pretty uniform breadth at either end. They are natives chiefly of India and the Malay Peninsula, but a few are found in Australasia and the Pacific Islands.

History. The cultivation of *Dendrobiums* dates from the beginning of the century—or rather, we should say, the first Denrobe was introduced then, Roxburgh having sent several species to Kew from India, followed by Pierard and Wallich; but owing to the mistaken notions then prevailing, and to which we have already referred at some length, these cannot be said to have been cultivated. And yet the plants tried their best to explain how they should be treated, for Mr. John Smith, in his *Records of Kew*, tells how, in the year 1822, he found these plants of Roxburgh's "on a shelf above a flue against the back-wall in what was then called the propagating-house. . . . There were also plants of *Dendrobium Pierardi* and *D. cucullatum*, flowering freely, which had recently been brought home from Calcutta by Mr. Pierard." The roots of some of these had attached themselves to the wall. Among the early introductions were the two species named, which came about 1815 from India, whence also came *D. Calceolaria* in 1820, as also *D. crumentatum* and *D. fimbriatum* in 1823. The beautiful *D. nobile* was introduced from China in 1836, and *D. devonianum* from India in 1837. *D. Farmeri*, introduced 1847, we also owe to India. Many fine species have been brought into cultivation quite recently, and the country of their origin, with the date, will be found marked against these species below.

Principal Species. DENDROBIUM AGGREGATUM (assembled together). Pseudo-bulb, thick, bearing a single leaf. Flowers deep yellow in arching racemes, 6 inches long; March to May. Introduced from North India, 1837. The var. *majus* has larger flowers. Greenhouse; best grown on block.

D. CRASSINODE (thick-noded). Like *D. Wardianum*, except that the stems are swollen at the nodes; spring. Stove. Birma, 1868.

D. CALCEOLARIA (slipper-like). Pseudo-bulbs 4 feet high. Flowers large, bright yellow, about twelve in a raceme. Summer. Stove, or warm greenhouse. Also known as *D. moschatum*.

LYCASTE SKINNERI

$^1/_3$ Nat. size

PL. 240

D. DALHOUSIEANUM (Dalhousie's). Stems 2 to 5 feet, stout. Flowers in drooping racemes; the largest in the genus, pale yellow, with two large crimson blotches on the labellum; spring. Stove. Birma, 1828.

D. DEVONIANUM (Duke of Devonshire's). Pseudo-bulbs 1 to 3 feet long. Flowers 2 inches across, creamy-white, tinged with pink; petals tipped with magenta: lips margined with purple, spotted with orange, and frilled at the edge: March and April. Stove. Should be grown in basket or on block.

D. FALCONERI (Falconer's). Stems slender, knotted. Flowers solitary from the nodes, 3 inches wide, white tinged with rose, the lip blotched with purple; spring. Stove. Assam, 1856.

D. FARMERI (Farmer's). Leafy stems club-shaped, 1 foot high. Flowers pale straw-colour tinged with pink; lip golden-yellow; in long pendulous racemes; May. Stove. Introduced from India, 1847. The var. *albiflorum* has white flowers with downy, orange lip. The var. *aureoflavum*, shown in our Plate 238, has yellow flowers with a golden lip. Introduced from Moulmein, 1864.

D. FIMBRIATUM (fringed). Stems 4 to 5 feet long. Flowers in loose pendent raceme, each two inches across, bright yellow, the lip deeply fringed and blotched with orange: spring. Stove. Birma, 1820. The variety *oculatum* has a maroon-red blotch on the lip.

D. NOBILE (noble). Stems 2 to 3 feet high. Flowers large, purplish rose, lip deep maroon: January to April. Greenhouse evergreen. Introduced from China, 1836. There are a number of varieties, showing considerable range of tint; the plant figured in Plate 237 is one of these. One of the most easily grown Orchids. Small specimens do well in baskets; larger ones require pots. Numerous hybrids between this and other species have been raised.

D. PHALÆNOPSIS (moth-orchid-like). Stems 1 to 3 feet long. Flowers in elegant racemes 2 to 3 inches across, white tinged with rosy-mauve, the lip deep maroon. A recently popularised species from New Guinea. It is nearly always in flower. Stove.

D. PIERARDII (Pierard's). Stems 2 to 4 feet long. Flowers white or pale pink, the lip primrose streaked with purple; in long racemes; winter. Greenhouse species of pendulous habit, best grown on a block or in a basket.

D. THYRSIFLORUM (thyrse-flowered). Stems 1 to 2 feet long. Raceme pendulous, 6 to 12 inches long, composed of many large flowers symmetrically arranged, sepals and petals white, lip fringed, orange yellow. One of the most beautiful; spring. Stove. Birma, 1864.

D. WARDIANUM (Ward's). Stems 2 to 4 feet long, 1 inch thick,

pendulous. Flowers 3½ inches across, thirty or forty in a raceme; sepals and petals broad, thick, lower part white, upper part magenta; lip large, upper part white, lower rich orange with two magenta spots; May. Stove plant. Introduced from Assam, 1863. Must be grown in basket or on block.

There are numerous beautiful hybrid Dendrobiums of garden origin; the best are: *Ainsworthii* (aureum × nobile), 1874; *leechianum* (nobile × aureum), 1882; *splendidissimum* (aureum × nobile), 1879; *Venus* (Falconeri × nobile), 1890.

Cultivation.

Dendrobiums as a genus are among the most beautiful of Orchids, and therefore well worthy the attention of the amateur. The erect-growing species may be potted in a mixture of equal parts fibrous peat and sphagnum-moss, with the addition of charcoal, but the pot should be first filled to two-thirds of its height with drainage material, upon which the compost should be raised in a cone above the rim and pressed firmly around the base of the plant. During the period of growth they require a very hot house and plenty of sunshine; water must be given abundantly, but it is advisable not to syringe the plants, as mischief sometimes results from water remaining stagnant in the axils and leaf-sheaths. Species of pendulous habit should be grown in baskets or on blocks. If planted in the ordinary Orchid-basket the latter should be lined with sphagnum-moss and roughly broken peat, and the plants fixed firmly by some more of the same material. Blocks must be covered with the sphagnum, secured in position by fine copper wire, a few turns of which should be so made around the plant as to fix it firmly. This is a point of considerable importance, as any looseness will result in injury to the plant. The syringe must be used two or three times a day to Dendrobes in baskets or on blocks. In the former case the spray should be confined to the roots and the sphagnum; in the case of blocks it is not of such great importance, as the blocks are hung nearer the glass, where drying is more rapid. Two or three times a week these must be dipped into a pail of water. Care must be taken to use only *clean* water that is also as warm as the temperature of the house; it should, in fact, have stood in the house for a few hours before using it. Fresh growth usually commences with or after development of flowers; the plants must be re-potted at this time.

When growth has almost ceased, the water-supply must be cut off, and a lower temperature and drier atmosphere obtained for the plants, where they can receive all the available sunshine, and so ripen their stems or pseudo-bulbs. If they now show any tendency towards withering, give

ODONTOGLOSSUM CRISPUM

Nat. size

PL. 241

water, but very sparingly. The period of necessary rest has arrived, and all that would stimulate the plant to growth must be avoided. *D. nobile*, though naturally flowering in spring, may be flowered in winter, if introduced to the stove in the autumn.

Description of Plates 237 and 238.

Plate 237. *Dendrobium nobile*, var. Upper portions of two stems with leaves and flowers. Fig. 1 is a section of the flower; 2, the four parallely-compressed pollen-masses; 3, two of the pollen-masses separated from the cell.

Plate 238. *D. Farmeri*, var. *aureoflavum*. Fig. 1, plant greatly reduced; 2, raceme of flowers, natural size; 3, the column enlarged; 4, the pollen-masses, natural size.

CALANTHES

Natural Order ORCHIDEÆ. Genus *Calanthe*

CALANTHE (Greek, *kalos*, beautiful, *anthos*, flower). A genus of about forty species of handsome stove Orchids of terrestrial habit. The stems are reduced to pseudo-bulbs, and the leaves are broad and many-ribbed, usually evergreen. The flowers, which are produced in long, showy spikes, are distinguished by the production of the lip into a kind of spur, and its attachment to the column. The anther is two-celled, and contains eight distinct pollen-masses tapering into points, the sticky secretion which connects them afterwards hardening into a disk-like gland adjoining the beak. The species are chiefly from the Indo-Malayan Region, but extend also to the South Pacific Islands and to Tropical and South East Africa, whilst a few species occur in Central America and the West Indies.

History.

The first *Calanthes* introduced appear to have been *C. veratrifolia* from India in 1819, and *C. sylvestris* from Madagascar in 1823. *C. furcata* came from the Luzon Isles in 1836, *C. striata* (better known as *C. Sieboldii*) from Japan in 1837, *C. Masuca* from India in 1838. *C. Dominii* is a hybrid produced by crossing *C. Masuca* and *C. veratrifolia*. *C. Veitchii* is the result of a cross between *C. vestita* and *C. rosea*.

Principal Species.

CALANTHE FURCATA (forked). Flowers creamy-white, abundant, in erect spikes 3 feet long.

C. MASUCA (native name). Flowers deep violet with a more intense violet-purple lip; spikes 2 feet long; June to August. The var. *grandiflora* produces much larger flowers in spikes 3 or 5 feet high.

C. STRIATA (streaked). Flowers large, yellow, in erect spikes 1 foot high. Evergreen.

C. VERATRIFOLIA (Veratrum-leaved). Leaves with many margins, 2 feet long. Flowers pure white, the sepals green-tipped, and the disk of labellum studded with golden papillæ; in erect spikes 2 to 3 feet high: May to July.

C. VESTITA (clothed). Flowers pure white, numerous, in a nodding spike. Introduced from India. There are many varieties; among them var. *igneo-oculata*, which has the lip and the base of column blotched with fiery red (Borneo, 1876); var. *luteo-oculata* has a blotch of yellow in the middle of the lip; var. *oculata-gigantea* (Borneo, 1886), flowers 3 inches across with fiery-red blotch on the base of the lip; var. *rubro-oculata*, flowers 2 inches across with a blotch of rich crimson; var. *Turneri* has larger flowers with rose-coloured eye.

Hybrids. C. DOMINII (Dominy's). Flowers lilac with deep purple lip.

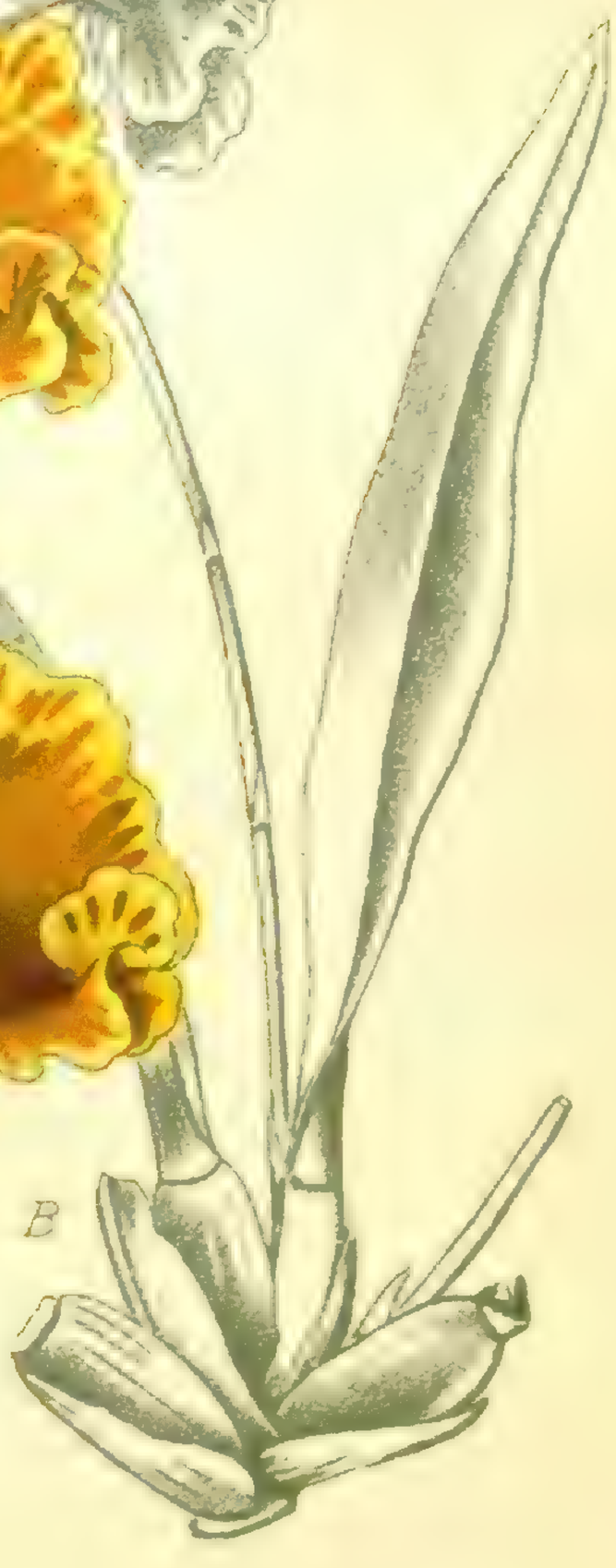
C. VEITCHII (Veitch's). Flowers bright rose with white throat, numerously produced in erect spikes 3 feet high; winter.

Cultivation. *Calanthes* are most beautiful Orchids when properly managed. After the flowers have faded the pseudo-bulbs should be kept dry on a shelf until new growth pushes at the base. They should then be shaken out of the old soil, the roots cut to a length of about 2 inches, and then potted singly in 3-inch pots, or in threes in 5-inch pots, in a compost of loam, leaf-mould, roughly-broken peat, a little silver-sand, and some dried cow manure. They should then be placed near the glass in a warm house. Until they are well rooted they require very little water, but when they are well started they require both heat and water in plenty. When the flowers appear they should be removed to a cooler situation, where the flowers will last for a long period. When these have passed, the evergreen species must still be supplied with plenty of water, and allowed to grow. They are propagated by division, and by separating the suckers. This genus is specially worthy of attention from the amateur.

CŒLOGYNES

Natural Order ORCHIDEÆ. Genus *Cœlogyne*

CŒLOGYNE (Greek *koilos*, hollow, and *gyne*, a female: in allusion to the deeply hollowed-out stigma. A genus of about fifty handsome stove



ONCIDIUM FORBESII

Nat. size

PL. 242

epiphytes with pseudo-bulbs and large flowers. In some species the leaves are not produced until after flowering. The petals are narrower than the sepals, and the hood-shaped lip has fringed veins. The column is broad and membranous, and there are four waxy pollen-masses which cohere by means of a granular substance. The hollowed stigma is prominent and two-lipped. The species are natives of India and the Malay Archipelago, one extending to South China.

Principal Species.

Cœlogyne barbata (bearded). Flowers large, pure white, the lip cut into three, its edges fringed with sepia hairs; in erect spikes. Introduced from Northern India, 1837.

C. corrugata (wrinkled). Pseudo-bulbs much wrinkled. Flowers pure white, lip veined with orange and with a yellow plate in front; in erect racemes; autumn. Introduced from Southern India, 1866. Cool house.

C. cristata (crested). Pseudo-bulbs oblong, smooth, shining. Leaves narrow, leathery, twin. Flowers 3 to 4 inches across, fragrant, pure white, the lip with a central blotch of rich yellow, and the veins crested with a golden fringe; in many-flowered, slightly drooping racemes; December to March. Introduced from Himalaya, 1837. This does not require a high temperature, even when growing; whilst when grown it must be kept quite cool, and is best removed when flowering to the conservatory or drawing-room: returning it to a warm house *before* growth recommences. There are several named varieties.

C. Cumingii (Cuming's). Flowers white, lip bright yellow with white down the centre. Introduced from Singapore, 1840.

C. dayana (Day's). Pseudo-bulbs cylindric, 6 inches long; leaves lanceolate, 2 feet long. Flowers on long pendulous scapes, 2 feet or more, each 2 inches across, yellow, lip streaked with white and fringed with brown; June. Stove. Borneo, 1884.

C. massangeana (Massange's). Pseudo-bulbs pear-shaped, 4 inches long: leaves plicate, 18 inches by 6 inches; racemes and flowers as in *C. dayana*, but petals wider and lip longer. Malaya, 1878.

C. ocellata (eyed). Pseudo-bulbs oval; leaves long and narrow. Flowers pure white, lip fringed or crested, streaked and spotted with yellow and brown at the base, and with two yellow spots on each side lobe; column bordered with orange; in erect racemes: March and April. Introduced from Northern India, 1822. Suited for block culture.

C. speciosa (showy). Pseudo-bulbs somewhat oblong; leaves oblong-lance-shaped, thin, solitary. Flowers over 3 inches across, usually in pairs; sepals and petals brownish or olive-green; lip yellow, marked with dark red, dark brown, and pure white, crests and margins fringed; blooming almost continuously. Introduced from Malaya, 1845.

C. TOMENTOSA (hairy). Like *C. dayana*, but pseudo-bulbs and leaves smaller, and flowers coloured pale orange-red, with light streaks on the lip; summer. Stove. Borneo, 1854.

Cultivation. With the exception of the species indicated as suitable for block-culture, *Cœlogynes* should be grown in pots or pans. After attending very particularly to the drainage of these, fill up in a conical mound above the rim with a mixture of fibrous peat and living sphagnum in equal portions, to which a little silver sand has been added. Upon this cone the *Cœlogynes* should be planted and pressed in firmly, then placed in a dry temperature ranging from 75° to 85° in summer, and from 65° to 70° in winter. During the flowering and resting periods, however, they will be much better off in a cool house. During growth these do not require so much moisture as most Orchids, and during the rest they need only sufficient to prevent shrivelling. Water should at all times be given to *Cœlogynes* with a fine-rosed can, and care taken that it does not lodge in the axils, etc.

INDIAN CROCUSES

Natural Order ORCHIDEÆ. Genus *Cœlogyne*

Sub-genus *Pleione*

PLEIONE (Greek, *pleion*, a year, in allusion to the annual duration of the pseudo-bulbs). For garden purposes it is better to keep these separate from *Cœlogynes*, although botanists have united them. *Pleiones* are alpine plants growing on moss-covered tree-trunks or rocks at an elevation of from 3000 to 10,000 feet on the Himalaya. They have *annual* fleshy pseudo-bulbs, more or less flask-shaped and mottled. The leaves, which are lance-shaped, plaited, and from 6 to 9 inches long, fall off before the flowers develop. The flowers spring singly or in pairs from the base of the pseudo-bulb; they are large, with long spreading petals and sepals, and an oblong many-keeled fringed lip.

Principal Species. PLEIONE HUMILIS (dwarf). With bottle-green ribbed pseudo-bulbs, and flowers 3 inches across, white, with lines and blotches of amethyst purple on the lip; January. Introduced from Nepaul, 1866.

P. LAGENARIA (bottle-shaped). With depressed irregular pseudo-bulbs, dull green mottled with brown, and flowers 3 inches across, rosy lilac, the lip striped and blotched with purple, margin white; November. Introduced from Khasia, 1856.

PHALÆNOPSIS SCHILLERIANA

Nat. size

PL. 243

P. MACULATA (spotted). Pseudo-bulbs as in the last; flowers 2 inches across, white, the lip striped and blotched with purple; November. Introduced from Khasia, 1837.

P. PRÆCOX (early). Pseudo-bulbs as in the last; flowers 3 inches across, light rose-purple, lip with a bright yellow disk and a few red spots; fragrant, usually solitary. Var. *wallichiana* has flowers of a darker shade of purple; November. Introduced from Khasia, 1837.

Cultivation. *Pleiones* require treatment somewhat similar to that advised for Calanthes, with the following modifications:—They should be grown in a sunny greenhouse; they require a compost of fibrous peat, sphagnum, leaf-mould, and sand; they should be repotted about a week after the flowers fade; and they are best grown in 9-inch pans, planting them about 2 inches apart.

EPIDENDRUMS

Natural Order ORCHIDEÆ. Genus *Epidendrum*

EPIDENDRUM (Greek, *epi*, upon, and *dendron*, a tree). A genus of about four hundred species of stove and greenhouse plants, of which, however, comparatively few are cultivated, on account of the smallness and dinginess of their flowers when contrasted with those of some other genera. Most of the species are epiphytes, as the name suggests, though many of them grow in the ground. In some the stems are long and leafy, in others reduced to pseudo-bulbs. The leaves are strap-shaped and leathery, and the flowers are solitary or in spikes, racemes, or panicles. The characteristic feature is found in the partial union of the fleshy base of the lip with the edges of the elongated column. The base of the lip is traversed by a passage closed at one end. There are four equal pollen-masses. They are natives of Tropical America.

Principal Species. EPIDENDRUM CILIARE (fringed). Pseudo-bulbs oblong; leaves in pairs. Flowers fragrant, several in a raceme, greenish yellow, except the three-lobed lip, which is white and fringed; winter. Native of Tropical America. Introduced from West Indies, 1790. Stove.

E. NEMORALE (woodland). Pseudo-bulbs oval, 3 to 5 inches high; leaves in pairs. Flowers 3 inches across, in large drooping panicles, delicate mauve or rosy-lilac, lip striped with violet; sepals and petals lance-shaped. Introduced from Mexico, 1840. Should be grown in stove, with full exposure to sun.

E. PANICULATUM (panicled). Stems tall, reed-like, 2 to 4 feet high. Leaves lance-shaped, in two rows. Flowers purple or lilac-purple, the column tipped with yellow; very numerous, in a long drooping branched panicle, a foot or more in length. Greenhouse species. Introduced from Tropical America, 1868.

E. PRISMATOCARPUM (prism-fruited). Pseudo-bulbs, flask-shaped, a foot high, dark green; leaves evergreen. Flowers fragrant, yellow-green spotted with black or dark purple, lip lilac-purple with white border; raceme erect, ten- or twelve-flowered; June. Greenhouse species. Introduced from Central America, 1862.

E. VITELLINUM (yolk-of-egg-like). Pseudo-bulbs and leaves glaucous. Flowers orange-scarlet, 2 inches across, with bright yellow lip; in erect spike, ten- to fifteen-flowered; summer. Stove plant. Introduced from Guatemala, 1840. The var. *majus* from Mexico has larger flowers with broader petals. Requires a warm moist atmosphere, but often difficult to flower several years in succession.

Culture. For cultural purposes *Epidendrums* may be treated as though they were *Cattleyas*, except that the former do not require so high a temperature as the latter. As want of space precludes one traversing the ground, we ask readers to kindly turn to the Cultural Directions on page 519.

DIACRIUMS

Natural Order ORCHIDEÆ. Genus *Diacrium*

DIACRIUM (Greek, *di*, two, and *akris*, a summit: in allusion to the two extremities of the column). A genus of about four species, differing from *Epidendrum* in the double prolongation of the column. *Diacrium bicornutum* (two-horned) is the principal species horticulturally, and it has generally been found very difficult to grow. Its pseudo-bulbs are stout, 1 foot to 1½ foot high, hollowed in the centre and inhabited by a small species of ant. Leaves short and leathery, produced at summit of pseudo-bulbs, as also are the ten- or twelve-flowered spikes. The flowers are white, the lip spotted with crimson. It grows on rocks near Trinidad, so close to the sea that it is frequently bathed in sea-spray. It should be grown on a block suspended in a moist atmosphere of high temperature, with full exposure to the sun; and after flowering, the pseudo-bulbs should be well ripened by full sunlight in lower temperature with less moisture.

VANDA TRICOLOR

Flower Nat. size

PL. 244

CATTLEYAS

Natural Order ORCHIDEÆ. Genus *Cattleya*

CATTLEYA (named in honour of William Cattley, a "patron of botany" and collector of rare plants). A genus of about twenty-five species of evergreen pseudo-bulbous Orchids, with usually a solitary leathery leaf from the apex of the pseudo-bulb: in some species there are two or even three leaves. The flowers are often 7 or 8 inches across, of rich colours, and are borne in a raceme from the top of the pseudo-bulb. They have a single series of four pollen-masses. They are natives of the warmer parts of America, from Brazil to Mexico, and grow at an altitude between 4000 and 6000 feet.

History. The introduction of living *Cattleyas* began in the year 1815, when *C. Loddigesii* came from Brazil. This was followed three years later by *C. labiata*, the prototype of many beautiful varieties, of which one of the best is figured in our Plate 239. Yet another three years and *C. Forbesii* was introduced, followed by *C. intermedia* (1824), and *C. guttata* (1827). Thus the first five members of this magnificent genus all came from Brazil. In 1836 La Guayra yielded the var. *Mossiæ* of *C. labiata*, and in the same year came *C. Skinneri* from Guatemala. Three years later Brazil showed that her good things had not been exhausted, by sending *C. Aclandiæ*, and two years later still *C. granulosa*. All these are fine plants, that hold favoured positions in public esteem to-day in spite of many more recent introductions, and the home production of many splendid hybrids. The var. *Trianæ* of *C. labiata* came from the Cordilleras in 1856, *C. schilleriana* from Brazil in 1857, and the var. *Warscewiczii* from Columbia in 1867. The genus holds the first place in the estimation of growers, and some of the species and varieties have realised high prices at public auction. Perhaps this has been more especially the case with varieties and secondary varieties of *C. labiata*: for instance, £250 has been paid for a fine form of the var. *Trianæ*, and *Trianæ Dodgsonii* has realised £194, 5s., *Trianæ Osmanii* £225, 15s., and the var. *percivaliana* £231. These prices do not continue when a stock has been obtained, and the last-mentioned variety may to-day be found offered in dealers' catalogues for half a guinea. There are also many hybrids of garden origin.

Principal Species. CATTLEYA ACLANDIÆ (Acland's). Pseudo-bulbs slender, 5 or 6 inches high: leaves oval, leathery. Flowers in

pairs, chocolate-brown, streaked and barred with yellow; lip large, varying from rose to purple; July.

C. BOWRINGIANA (Bowring's). Stems club-shaped, 12 inches long, two-leaved. Flowers in erect racemes, crowded, like those of *C. Skinneri*, but flowers smaller and coloured rose-purple; lip deep purple and white; October. British Honduras, 1884.

C. CITRINA (citron). Pseudo-bulbs oval, small, two- or three-leaved. Flowers solitary, fragrant, waxy-looking, of a bright lemon tint; May to August. Introduced from Mexico, 1838. Should be grown on the *underside* of a block, and hung in greenhouse till end of summer, then removed to the vinery.

C. DOMINIANA (Dominy's). Flowers 6 inches across, white shaded with pink; lip rosy-purple edged with white, and orange at base. Hybrid. There is a var. *alba*, in which the lip also is white, except for a lilac blotch in centre. The var. *lutea* has blush-coloured flowers, with rose-streaked yellow lip, paling almost to white in front.

C. EXONIENSIS (Exeter). Flowers soft rosy-lilac, with large, white-margined, purple lip. Hybrid, obtained by crossing *C. labiata Mossiæ*, and *Lælia purpurata*.

C. GUTTATA (spotted). Leaves leathery, twin, at summit of pseudo-bulbs. Flowers green, tinted with yellow and spotted with crimson; lip white, stained with purple; raceme five- to ten-flowered; October and November. The var. *Leopoldii* has more numerous and fragrant flowers, of a deep chocolate colour spotted with dark red; the lip rich red-purple. The var. *amethystoglossa* has taller stems and larger flowers, spotted with purple.

C. INTERMEDIA (intermediate). Stems 1 foot high, jointed, two-leaved. Flowers three to five on erect racemes, rosy or rosy-purple; lip blotched with deep violet-purple; May to July. Among the varieties of this species is var. *superba*, with delicate rosy flowers and broad purple lip.

C. LABIATA (lipped). Stems 5 to 10 inches long, club-shaped, compressed, wrinkled when old, one-leaved; leaf oblong, leathery, 6 to 10 inches long, 2 inches wide. Flowers 6 or 7 inches across, three or four in a raceme, deep rose-coloured, the petals broad and waved; lip large and somewhat hooded, the front portion deep velvety-crimson; late autumn. The varieties are numerous and very beautiful; among them are: Var. *dowiana*, with very large, bright nankeen-coloured flowers, and rich purple lip shaded with violet-rose and streaked with yellow. From Costa Rica, 1866. Should be grown in basket, near the glass, and with more heat than other *Cattleyas* require. Var. *Eldorado*, pale pink with purplish

AERIDES LAWRENCEÆ

$^{2}/_{3}$ Nat. size

PL. 245

crimson and orange lip. Brazil, 1869. Var. *gaskelliana*, flowers 7 inches across, similar to var. *Mossiæ*, but paler. Venezuela. Var. *Mendelii*, sepals and petals large and broad, varying from white to pale pink; lip rich magenta. Columbia. Var. *Mossiæ*, flowers 6 inches or more across, varying from blush to deep rose; lip beautifully fringed or crisped at the edges. Venezuela (Plate 239). Var. *percivaliana*, similar to var. *Mossiæ* but smaller, and more intensely coloured. Columbia. Var. *Triana*, blush, with purple-fronted lip and yellow throat. Exceedingly variable, with numerous sub-varieties. Var. *Warneri*, flowers 6 to 8 inches across, rose-purple; lip veined with dark purple; disk yellow, streaked with white. Brazil, 1860. Var. *Warscewiczii* (*gigas*), flowers 7 to 9 inches, rosy-mauve; lip deep purple with a yellow disk and radiating lines, and two eye-like blotches of white. Columbia, 1848. There are numerous sub-varieties of this last; *hardyana* is supposed to be a natural hybrid between this and *dowiana*.

C. LAWRENCIANA (Lawrence's). Stems and leaves as in *C. labiata*, but tinged with purple. Flowers five to seven on an erect scape, each 4 inches across, rosy-lilac, the lip folded almost to the apex, where it is purple, shaded with dark maroon and lined with white; spring. British Guiana, 1884.

C. LODDIGESII (Loddiges'). Stems and leaves as in *C. intermedia*; flowers 4 inches across, rosy-lilac; lip amethyst-purple and white; August. Rio de Janeiro, 1822. Var. *Harrisoniæ* has an orange-yellow disk, and flowers in spring.

C. SKINNERI (Skinner's). Pseudo-bulbs 12 to 18 inches high; leaves fleshy, twin. Flowers rosy-purple with deeper shadings; base of lip white; April and May.

C. WALKERIANA (Walker's). Stems spindle-shaped, 2 to 5 inches long; leaves oblong, 4 inches long. Flowers one or two on a short scape, 4 inches across, flat, bright rose-purple; lip amethyst-purple with a white disk; spring. Brazil, 1840. There are several named varieties.

Cultivation. Small specimens of *Cattleyas* may be grown on blocks with sphagnum-moss, but larger individuals will blossom better and give less trouble if potted. A good depth of open drainage material is essential, upon which a cone of soil should be built up above the rim of the pot. This should consist of a compost of peat (free from grit) and sphagnum chopped up whilst living, to which some sharp silver sand should be added. Upon this mound the plant should be pressed into the surface, and the soil made very firm around the roots. The same care as previously recommended in the case of other genera must

be taken in watering *Cattleyas*, to prevent moisture lodging about the base of the leaves, etc. Block-culture as prescribed for *Dendrobiums* applies equally to *Cattleyas* grown in that fashion. A long season of rest must be allowed after flowering, to ensure a good display next season. Abundant water is essential when growing, and at this period the plants should be in a temperature ranging from 75° to 85°. During the resting period this may be reduced to from 65° to 70°, and water given only when necessary to keep the pseudo-bulbs fairly plump. Many hybrid *Cattleyas* have been raised, and with few exceptions they are all beautiful additions to the genus. They are, however, very rare, and as yet too expensive for most collectors.

Description of Plate 239. *Cattleya labiata*, var. *Mossiæ*, about one-third less than the natural size.

LÆLIAS

Natural Order ORCHIDEÆ. Genus *Lælia*

LÆLIA (named after a Vesta Virgin). A genus of about thirty species of Orchids, closely allied to *Cattleya*, from which, in fact, they are separated chiefly on account of the pollen-masses being eight in a double series instead of a single group of four. It was thought when the genus was established that there were other differences, but this distinction has broken down with the knowledge of a larger number of species. They are natives of the warmer parts of America, from Brazil to Mexico.

History. *Lælias* are of more recent introduction than *Cattleyas*, for *L. Perrinii*, which appears to have been the first species to reach England in a living state, did not arrive from Brazil until 1831, followed about 1834 by *L. anceps* from Mexico. *L. cinnabarina*, from Brazil, was introduced in 1836. *L. majalis*, the beautiful May-flower of the Mexicans, arrived in 1838, in which year also came *L. albida*, *L. autumnalis* and *L. furfuracea*, from the same country. The magnificent *L. purpurata*, whose portrait forms the Frontispiece to the present volume, was introduced from Brazil in 1852. Some fine hybrids have been produced, which are included in this genus. *L. flammea* is the result of a cross between *L. cinnabarina* and *L. Pilcheriana*, the last a hybrid between *L. Perrinii* and *Cattleya crispa*; *L. philbrickiana* had origin in an alliance between *L. elegans* and *Cattleya Aclandiæ*; *L. callistoglossa* is a hybrid between *L. purpurata* and *Cattleya labiata*, var. *Warscewiczii*.

LADY'S SLIPPER

(CYPRIPEDIUM INSIGNE)

Nat. size

PL. 246

Principal Species.

LÆLIA ANCEPS (double). Pseudo-bulbs oval, somewhat quadrangular; leaves broad-lance-shaped, singly or in pairs. Flowers 3 or 4 inches across, fragrant rosy lilac; lip deep purple; racemes 1 to 2 feet long, three- to six-flowered, and large plants producing as many as twenty racemes; December and January. There are numerous good varieties, including *alba* and its forms, which have pure white sepals and petals, and variously tinted and blotched labellum.

L. AUTUMNALIS (autumnal). Pseudo-bulbs oval, ribbed; leaves slender, oblong, leathery. Flowers fragrant, soft rose colour; the lip three-lobed, rosy white, with yellow centre; racemes 2 to 3 feet long, three- to six-flowered; December and January. Var. *atrorubens* has flowers of a rich magenta or crimson shade.

L. CINNABARINA (cinnabar). Pseudo-bulbs 5 to 10 inches long, somewhat flask-shaped. Flowers orange-scarlet, three to five on stem nearly 2 feet long; March.

L. DOMINIANA (Dominy's). Pseudo-bulbs spindle-shaped; leaves oblong-strap-shaped, solitary. Flowers light purple, with black-purple lip; autumn. Hybrid. 1878.

L. ELEGANS (elegant). Pseudo-bulbs slender, stem-like, a foot or more long; leaves leathery, in pairs. Flowers three to five on a stout stem, each 5 inches across, varying from white or rose to carmine; lip deep purple. Introduced from Brazil, 1865. There are a number of good varieties.

L. FLAVA (yellow). Pseudo-bulb 6 inches high, swollen at the base; leaves narrow, 6 inches long; stem a foot or more long, bearing about six flowers, about 2 inches across, orange-yellow; autumn. Brazil, 1839.

L. GRANDIS (grand). Pseudo-bulbs club-shaped, 6 to 12 inches long, one-leaved; leaves 9 inches long. Stems erect, bearing three to five flowers, which are 4 to 6 inches across, nankeen-yellow; the lip white, veined with purple. A very variable species, but all the forms are beautiful; that called *tenebrosa*, with plum-coloured segments, being perhaps the best. Brazil, 1849.

L. HARPOPHYLLA (sickle-leaved). Stems tufted, thin, 6 to 9 inches long; leaves 6 inches. Stems slender, 5 inches long, bearing about six flowers 2 inches across, cinnabar-red, the small lip white; April. Brazil, 1865.

L. PUMILA (small). Pseudo-bulbs ovate, 2 inches long; leaves same length. Stem short, bearing a flower 5 inches across, rose-purple; lip maroon-purple, with a pale margin; summer. Brazil, 1838. There are several distinct varieties.

L. PURPURATA (purplish). Pseudo-bulbs large, stout; leaves solitary,

broad, leathery. Flowers 5 or 6 inches across, varying from white to rose; lip as much as 3 inches long, rich purplish crimson. Frontispiece to vol. iv. There are many beautiful varieties of this, the finest, member of the genus.

Cultivation. The instructions given under this head in relation to *Cattleya* apply equally to the present genus. *L. purpurata* requires a tropical temperature, and *L. grandis* likes extra warmth when growing. There are numerous garden hybrid *Lælias*, but what is said of the hybrid *Cattleyas* applies also to these.

Description of Frontispiece. *Lælia purpurata.* Fig. 1, entire plant greatly reduced; 2, a single flower, natural size; 3, the column; 4, the eight pollen-masses in a double series.

LYCASTES

Natural Order ORCHIDEÆ. Genus *Lycaste*

LYCASTE (named after Lycaste, the daughter of Priam). A genus of about thirty species of stove or greenhouse Orchids, distinguished by having the lip furnished with a transverse fleshy appendage, in some species notched, in others entire. The anther is two-celled, producing four pollen-masses, which do not lie parallel to each other, as in *Cattleya* and others. Leaves plaited lengthwise. They are natives of Tropical America, extending from Peru to Mexico, and the West Indies.

History. The earliest Lycastes introduced were then included in the genus *Maxillaria*. The series began with *Lycaste Barringtoniæ*, which was brought from the West Indies in 1790. Then there was a long break till 1824, when *L. aromatica* came from Mexico, whence also came *L. Deppei* in 1828. *L. tetragona* was introduced from Brazil in 1830, and *L. cristata* from British Guiana in 1834. *L. macrophylla*, a Peruvian species, dates from 1837, *L. cruenta* (Guatemala) from 1841, and from the same country came the splendid *L. Skinneri* a year later. *L. gigantea* and *L. lanipes* came from Columbia and Ecuador respectively in 1848. *L. jugosa* (1867) and *L. grandis* (1884) are Brazilian plants; and *L. rugosa* was introduced from Columbia in 1876. About half a dozen hybrids have been artificially raised.

Principal Species. LYCASTE AROMATICA (aromatic). Flowers yellow, lip hairy; free-flowering; winter and spring. Warm house. Mexico, 1826.

L. (*Paphinia*) CRISTATA (crested). Leaves oblong-lance-shaped.

MARANTA BICOLOR, *var. Kerchoviana*

Flower and Leaf Nat. size

PL. 247

Sepals white, interruptedly banded with purple; petals purple with whitish base. Scapes pendulous, few-flowered; June to August. Stove. British Guiana.

L. CRUENTA (bloody). Sepals fulvous green, petals deep yellow; lip deep orange, with crimson blotches like splashes of blood; March and April. Greenhouse or Vinery.

L. DEPPEI (Deppe's). Flowers pale greenish yellow, blotched with brown; lip white, spotted with crimson; crest golden-yellow; winter and spring. Warm house.

L. (*Colax*) JUGOSA (ridged). Pseudo-bulbs oval, smooth; leaves in pairs, 2 inches broad. Flowers 2 inches across; sepals cream colour; petals white, irregularly barred with rich dark purple; lip white, irregularly striped and veined with purple; scape two- or three-flowered, erect; April and May. Greenhouse.

L. (*Paphinia*) RUGOSA (wrinkled). Pseudo-bulbs very small, cylindrical, furrowed; leaves thin and slender. Flowers large, waxy-looking, creamy white, covered with red spots, some of which run together in two-flowered pendulous racemes. Stove.

L. SKINNERI (Skinner's). Pseudo-bulbs large; each bearing two or three broad plaited leaves. Flowers solitary, 4 to 6 inches across; sepals pale pink, petals rosy; lip rosy lilac, blotched with crimson; November to March. Intermediate house. Plate 240. There are numerous beautiful varieties, including one with pure white flowers.

Cultivation. All the Lycastes, except those of the section *Paphinia*, may be grown in a warm greenhouse. Some growers plant them in a mixture of fibrous loam, peat, and sand; others prefer to use a mixture of peat and sphagnum. They like a sunny, airy position and plenty of moisture when growing; less when at rest. They may be propagated by division. As a rule, however, they are imported in sufficient quantity to keep them cheap.

Description of Plate 240. *Lycaste Skinneri.* Plant about one-third of the natural size. Fig. 1, a flower of the natural size, or a little less; 2, a section through the same; 3, the column removed.

ODONTOGLOTS

Natural Order ORCHIDEÆ. Genus *Odontoglossum*

ODONTOGLOSSUM (Greek, *odontos*, a tooth, and *glossa*, a tongue: tooth-like processes on the lip). A genus of over a hundred species of green-

house Orchids, furnishing many of the most beautiful of what are popularly known as "cool" Orchids. The group to which this and the following genus belong are characterised by a usually short, stout rhizome, bearing more or less crowded pseudo-bulbs, crowned by one or two leaves, and from four to six leaves about the base. These leaves are sword-shaped or lance-shaped, leathery, and are not plaited lengthways, as in some earlier genera. The flowers have the sepals separate and spreading, the petals nearly equal, the lip crested and its base parallel with the column, which is usually long, narrow at the base and with wings or ears at the summit. Pollen-masses two, with a slender caudicle attached to an oval gland. They are natives of the Andes of Tropical America, from Bolivia to Mexico, at an altitude of 5000 to 10,000 feet.

History. The first living Odontoglot to be introduced was *O. bictoniense*, which came from Guatemala in the year 1835; it was long a favourite among growers, and is still to be seen in most collections. *O. cordatum* arrived from Mexico a couple of years later, whence also came *O. maculatum* in 1838, and *O. Insleayi* and *O. citrosmum* in 1840. *O. grande*, which appeared in 1839, was from Guatemala, and in the same year came *O. Rossii* from Mexico. Two other good species —*O. citrosmum* and *O. Insleayi*—were introduced from Mexico in 1840, and the next year came *O. laeve* and *O. pulchellum* from Guatemala. Other well-known sorts we may mention are *O. maxillare*, from Mexico in 1846, *O. Pescatorei* from Columbia in 1851, *O. Lindeni* from Columbia in 1852, *O. Hallii* from Peru in 1865, *O. cristatum* from Ecuador in 1869, and *O. blandum* from Columbia in 1870. The date of *O. crispum*—as of some others—is not recorded. An Odontoglot was introduced from Columbia in the sixties and named *O. Alexandræ* out of compliment to the Princess of Wales, and known by that name until quite recently; but it proved to be the species which Lindley had previously described as *O. crispum*, and *O. crispum* it is to-day, though the name of *Alexandræ* still lingers in Orchid-houses and trade lists. Hitherto the genus has not yielded many hybrids, notwithstanding the persistency of breeders. Three have been recorded, and others are known to be maturing.

Principal Species. ODONTOGLOSSUM BLANDUM (fair). Flowers yellowish white, with narrow sepals and petals; lip crisped.

O. CIRRHOSUM (curled or fringed). Pseudo-bulbs strap-shaped. Flowers white, spotted with dark purplish violet; lip wedge-shaped, with radiating lines and a few spots of purplish violet. Racemes many-flowered. Introduced from Ecuador, 1876.

O. CITROSMUM (Lemon-scented). Flowers numerous on drooping

INDIAN SHOT

(CANNA HYBRIDS)

$^1/_2$ Nat. size

PL. 248

racemes, white or rose, delicately scented as with lemon; lip crescent-shaped, purple; May.

O. CORONARIUM (crowned). Flowers reddish brown, edged with yellow; lip golden-yellow. Raceme erect, 1 foot high, bearing thirty or forty flowers. Introduced from Columbia, 1868.

O. CRISPUM (crumpled). Flowers white or blotched with red-brown, the edges of petals and sepals waved and toothed to an extent that differs in almost every individual; lip more or less yellow, spotted with reddish brown. One of the finest, as it is perhaps the most variable, of Orchids. Many of the most distinct of these variations are named. Plate 241.

O. GRANDE (magnificent). Flowers 4 to 7 inches across, orange-yellow, marked with chestnut-brown; lip creamy white, freckled with brown; racemes erect, four- to nine-flowered; autumn and winter.

O. HALLII (Hall's). Flowers 4 inches across, pale yellow, with irregular patches of chocolate-brown; lip white, stained with yellow, fringed, blotched with brown and purple. Raceme many-flowered.

O. HARRYANUM (Harry Veitch's). Flowers numerous on erect scapes 3 or 4 inches across, deep red-brown banded and margined with yellow; petals whitish at the base with purple lines; lip white, striped with purple; crest yellow. One of the handsomest. Autumn.

O. HASTILABIUM (halbert-lipped). Flowers fragrant, $1\frac{1}{2}$ inch across, creamy white, with transverse streaks of whitish brown; lip spear-shaped, white, with dark rosy base; raceme many-flowered, 2 or 3 feet high; summer.

O. INSLEAYI (Insleay's). Flowers 2 to 4 inches across, yellow or yellowish green, with transverse bands of dull reddish brown; lip narrow, bright yellow, dotted with cinnamon; raceme tall, five- to ten-flowered; winter.

O. LUTEO-PURPUREUM (yellow-purple). Flowers 3 to 4 inches wide, numerous on arched scapes; sepals and petals chestnut-brown and yellow; lip large, toothed or fringed, white or yellow, with a large brown-red spot in front. A most variable species. There are numerous named varieties.

O. MACULATUM (spotted). Flowers 3 to 4 inches across, soft deep yellow, spotted or barred with brownish crimson; lip heart-shaped, spotted with brown; racemes drooping, about six-flowered: spring.

O. PESCATOREI (Pescatore's). Habit of *O. crispum*. Flowers white; sometimes spotted; sepals and petals broad, spreading; lip fiddle-shaped, with purplish and yellow blotches at the base; panicles 1 to 2 feet long, erect or arched, bearing from ten to one hundred flowers. There are

numerous named varieties, and some of them are among the most valuable Orchids known. Spring.

O. ROSSII (Ross'). Flowers 1 to 2 inches across, white, spotted and barred with brown; lip with a lemon-yellow crest; two- to five-flowered. There are numerous named varieties; winter.

O. TRIUMPHANS (triumphant). Habit of *O. crispum*. Scape tall, arching, many-flowered; flowers 3 inches across, yellow, with large brown blotches; lip white or yellow, with a large chestnut-brown blotch in front; spring.

Cultivation. All the Odontoglossums known may be grown in a cool greenhouse, where the temperature is never lower than 45° Fahr. The range of temperature for the whole year most suitable for these plants is from 70° to 45°, the former being the maximum to be aimed at in the hottest weather. Fire-heat should never be used for them, except to prevent the temperature from falling below 45°. As a rule they continue to grow more or less all the year round, so that they must not be allowed to get dry, although in preceding genera a dry resting period is necessary. Where possible, they should pass the summer in a house having a northern aspect, or even be hung up under trees outside, where they will enjoy good light whilst being protected from the direct rays of the sun. In the winter they should be placed in a house having a southern aspect, and given all the sunshine possible. In summer they should be syringed in the evening after a hot day and allowed to have plenty of air whenever the temperature admits of it. *O. citrosmum* requires slightly warmer treatment, and should be wintered almost without water, until the new shoots and flower spikes appear, when water may be given. They should be grown in pots two-thirds filled with drainage, the other part with a mixture of peat-fibre and living sphagnum in equal proportions. September is the best time to repot them. They like to be kept moderately moist at the roots at all times.

Description of Plate 241. *Odontoglossum crispum.* Fig. 1, a plant greatly reduced: 2, flowers, natural size; 3, the column, detached; 4, the same, side view: 5, 5, pollen-masses, natural size and enlarged.

ONCIDS

Natural Order ORCHIDEÆ. Genus *Oncidium*

ONCIDIUM (Greek, *ogkos*, a tumour: referring to the warty crest at base of lip). A genus of about two hundred and fifty species, in many respects

KARATAS SCHEREMETIEWI

$^1/_3$ Nat. size

PL. 249

agreeing with *Odontoglossum*, but with the two lateral sepals sometimes united beneath the lip, and the lip itself continuous with the column, and with tubercles or a crest at its base. The column is shorter and not narrowed at the base, as in *Odontoglossum*. They are natives of Tropical America and the West Indies, their vertical distribution ranging from the hot moist valleys to the tops of mountains 12,000 or 14,000 feet above sea-level.

History. Oncidiums were discovered sufficiently early to suffer from that general stewing process of cultivation (!) to which we have already referred. The first species introduced as living plants were *O. carthaginense*, from the West Indies, in 1791, and flowered for the first time in a garden in Vauxhall in 1804. *O. altissimum* and *O. triquetrum* were brought from the West Indies in 1793 by Admiral Bligh, and presented to the Royal Gardens, Kew. In 1818 *O. barbatum* and *O. flexuosum* came from Brazil; *O. luridum* from the West Indies in 1822; *O. Cebolleta* from Brazil in 1823. *O. Papilio*, perhaps the most remarkable of all Orchids, was introduced from Trinidad in 1824; the allied *O. krameriannum* from Ecuador in 1852, was flowered in a garden in Hamburg, where it was named in compliment to the gardener, Kramer. It may be said that amateur Orchid-growing, as a fashionable cult, owes its origin to *O. Papilio*, for at a horticultural show in the year 1830 the Duke of Devonshire saw a specimen in flower, and was so struck by it that he desired to grow such magnificent plants himself. He built special houses for their accommodation, and sent out his own collectors; and his example was followed by a few other wealthy men. *O. ornithorhynchum* was introduced from Mexico in 1826, and *O. pulchellum* in the same year from the West Indies. *O. ampliatum* was brought from Central Amercia in 1832, *O. lanceanum* from Guiana in 1834, and the rich-flowered *O. Forbesii* from Brazil in 1837. *O. splendidum* came from Guatemala in 1862, *O. macranthum* from Tropical America in 1867, and the beautiful dwarf *O. Phalænopsis* from Ecuador in 1869.

Principal Species. ONCIDIUM AMPLIATUM (enlarged). Pseudo-bulbs large, compressed, spotted and streaked with reddish brown. Flowers large, clear yellow, in a much-branched panicle; April to June. Stove. Costa Rica.

O. BATEMANNIANUM (Bateman's). Pseudo-bulbs ovoid, 4 inches long, two-leaved; panicles tall, branched; flowers 1½ inch across, bright yellow, barred and blotched with brown. Greenhouse. Brazil.

O. CONCOLOR (one-coloured). A dwarf plant with ovate two-leaved pseudo-bulbs and drooping crowded stems of bright canary yellow flowers, 2 inches across. One of the most popular. Greenhouse. May. Brazil.

O. CRISPUM (curled). Flowers 2 to 3 inches across, wavy, bright copper colour; centre of lip blotched with golden yellow; in many-flowered erect raceme. Intermediate house. Winter. Brazil.

O. FLEXUOSUM (waved). Pseudo-bulbs flat. Flowers rather small, yellow, spotted with brown, in a branched panicle, 3 or 4 feet high. Of easy culture in the Intermediate house. An old favourite in gardens. Brazil.

O. FORBESII (Forbes'). Flowers large, reddish brown, the sepals and petals broad, and margined with golden yellow; disk pale; November. Intermediate house. Plate 242.

O. KRAMERIANUM (Kramer's). Similar to *O. Papilio*, but with more yellow in the flowers; spring. Stove. Ecuador.

O. LANCEANUM (Lance's). Leaves thick and leathery, spotted with reddish brown. Flowers large and fleshy, with a delicate vanilla-like fragrance, greenish yellow, barred and blotched with brown that more or less approaches to crimson in different individuals; lip violet and rose; in many-flowered erect racemes. Stove.

O. MACRANTHUM (large-flowered). Flowers 3 to 4 inches across, tough and leathery, golden-yellow, tinged with purple and sometimes streaked with crimson; the lip yellow, with purplish brown side-lobes and a white crest; panicle long, many-flowered; a superb Orchid; April to June. Intermediate house. Ecuador.

O. MARSHALLIANUM (Marshall's). Similar to *O. crispum*, which is often sold for it, but the flowers are yellow, with bars of red-brown on the sepals and petals; a magnificent species; May. Intermediate house. Brazil.

O. ORNITHORHYNCUM (bird's-bill). Dwarf. Pseudo-bulbs 1 or 2 inches high. Flowers small, fragrant, rose-purple, in many-flowered drooping panicles; October to February. Cool house.

O. PAPILIO (butterfly). Butterfly Orchid. Pseudo-bulbs oval, flat; leaves spotted and streaked with reddish brown. Scapes 2 feet or more long, bearing each one flower at a time; dorsal sepal and petals erect, 4 inches long, red-brown petals wing-like; lip heart-shaped, chestnut-red and yellow. The flower resembles a large butterfly. Should be grown on a block, with a sunny position in the stove.

O. SPLENDIDUM (splendid). Pseudo-bulbs and leaves succulent, purple-brown when old. Flowers 2 inches across, green, heavily barred with brown; lip large, golden-yellow; raceme 2 feet long. Intermediate house. Winter.

O. TIGRINUM (tiger-marked). Pseudo-bulbs roundish, leaves a foot long. Scapes 2 to 3 feet long, branched, and bearing many fragrant

ÆCHMEA FULGENS

Nat. size

PL. 250

flowers 3 inches across; the sepals and petals wavy, yellow and brown; the lip large, heart-shaped, bright yellow; winter. Intermediate house. Mexico, where it is known as the "Flower of the Dead" (*Flor de Muertos*).

Cultivation. We have already referred to the very great vertical range of Oncidiums in their natural habitat, and it will have been inferred by the reader that a corresponding difference in the treatment of species must be adopted in cultivation. Against some of the species described above we have written "stove"; these must be grown in a hot, moist atmosphere, with a summer-day temperature between 75° and 90°. These conditions, however, must only be maintained during the growing period. In winter such plants require less moisture, and the temperature should be much lowered—may indeed fall on a winter day to 60°. Large specimens should be grown in pots or baskets in a mixture of fibrous peat, sphagnum, and charcoal; smaller ones may be fastened to blocks. Those marked "Intermediate house" require the same treatment as that prescribed for *Cattleyas*, whilst those marked "Cool house" may be grown successfully in a greenhouse along with *Odontoglossums*. Most of this section succeed best as pot-plants, using the compost of peat-fibre and sphagnum with a little charcoal, and not allowing them to get dry at the roots even in winter. Propagation is effected by division.

Description of Plate 242. *Oncidium Forbesii*. Plant greatly reduced: flowers natural size. Fig. 1 is a front view of the column: 2, side view of the same; 3, the pollen-masses.

MOTH ORCHIDS

Natural Order ORCHIDEÆ. Genus *Phalænopsis*

PHALÆNOPSIS (Greek, *phalaina*, a moth, and *opsis*, resemblance). A genus of about twenty-one species of stove epiphytes, with very short stems, and fleshy leaves in place of the pseudo-bulbs of foregoing genera. The flowers are usually showy, with flat, spreading sepals and petals, borne in a loose raceme or panicle. In one section of the genus the petals are much broader than the sepals, whilst in the other section the petals are only of equal width with the sepals, or even narrower. The lip is three-lobed, and in some species the middle lobe is more or less distinctly divided into two horns or slender lobes, which help materially to give that moth-like appearance upon which the names of the genus are founded; it is spurless, and is connected by a short neck with the base of the almost cylindrical column. There is a one-celled anther containing two pollen-

masses, which are attached by a strap-shaped caudicle to a heart-shaped gland. The thick leathery leaves are as a rule two-ranked, and in some species—*P. Lowii* for instance—are shed in the dry season when growing naturally. Under certain conditions the flower spikes and roots of some species are proliferous. The plants are natives of the Indo-Malayan Region, where they grow upon rocks and tree-trunks.

History. The first living *Phalænopsis* introduced was *P. Aphrodite* from the Philippines in 1836. It was long known as *P. amabilis*, Dr. Lindley believing it to be the same species as that to which Blume had attached that name, and which was for years thought to be the only species. Eleven years later the true *P. amabilis* of Blume was introduced from Java, and the first species was re-named *Aphrodite* by Reichenbach. The two species appear to be closely allied, but the real *amabilis* has flowers often two-thirds larger than those of *Aphrodite*. *P. rosea* came from the Philippines in 1848; and from the same locality, in 1860, *P. schilleriana*, the finest yet known, was introduced. In addition to its lovely flowers, this species possesses the attraction of richly-marbled leaves. All the others are of more recent introduction, of which the dates are indicated below. A number of garden hybrids have been raised.

Principal Species. PHALÆNOPSIS AMABILIS (lovely) of Blume. Leaves light green. Flowers variable, as much as 5 inches across, pure white, the lip streaked with yellow; autumn. Also known as *P. grandiflora*. The var. *aurea* has the yellow of the lip more pronounced.

P. APHRODITE (Venus'). Leaves shorter and darker than those of *P. amabilis*. Flowers 3 inches across, pure white; lip streaked with crimson, orange, and yellow: in long racemes; flowering almost continuously. There are several named varieties.

P. ESMERALDA (Esmeralda's). Leaves broad, two-ranked, somewhat marbled. Flowers 1 inch across, rose-coloured; raceme erect, few-flowered. Introduced from Cochin-China, 1877.

P. LUDDEMANNIANA (Luddemann's). Leaves oval, 6 to 9 inches long; peduncles as long as the leaves, and bearing about six yellow and brown zebra-marked flowers, 2 inches across; lip purple. Philippines. March.

P. SANDERIANA (Sander's). Leaves dark green, sometimes mottled. Flowers large, rosy: lip white, marked with brown, purple, and yellow. Introduced from Philippines, 1882.

P. SCHILLERIANA (Schiller's). Leaves dull green, richly mottled with grey; 1 foot to 20 inches long, and 3 to 5 inches broad. Flowers $2\frac{1}{2}$ or 3 inches across, delicate rosy pink, of varying intensity; lip three-lobed, white and rose, with a couple of yellow protuberances at the base;

BILLBERGIA NUTANS

$^3/_4$ Nat. size

PL. 251

in panicles sometimes 3 feet long, containing as many as forty, sixty, or nearly a hundred blossoms, and lasting nearly two months; April to June. Philippines.

P. SPECIOSA (showy). Flowers amethyst-purple, with pale margin; lip club-shaped, rosy purple, with yellow spots on the side lobes. Introduced from the Andamans, 1883.

P. STUARTIANA (Stuart Low's). Habit and leaves like *P. schilleriana*. Flowers white or pale sulphur, with cinnamon blotches; in a many-flowered panicle. Introduced from Philippines, 1881.

P. VIOLACEA (violet). Leaves obovate, 6 to 10 inches long, of a light green colour, without mottling. Scapes short, bearing from two to five flowers 2 inches across; white, faintly tinted with rose; the lower half of the dorsal sepals and the lip coloured intense violet-purple. Introduced from Malaya, 1861. The var. *schræderiana* has larger purple flowers.

The best hybrids are:—*P. intermedia* (*Aphrodite* × *rosea*), *F. L. Ames* (*amabilis* × *intermedia*), *Harriettæ* (*amabilis* × *violacea*), *John Seden* (*amabilis* × *luddemanniana*), *Rothschildiana* (*amabilis* × *schilleriana*).

Cultivation. *Phalænopsids* require a hot, moist atmosphere in the stove; and from March till October, which is the growing period, a day temperature not lower than 70° must be maintained. During the summer the addition of sun-heat in the middle of the day will probably bring this up to 80° or more, and in the night it may drop to 70°. In winter it should not be allowed to fall below 65° at any time. They should be grown either in teak-baskets or on blocks, according to size of specimens, the smaller ones being more suitable for block-culture. Living sphagnum, clean crocks, and charcoal must be used, and the moss should form only a thin layer at the top. The roots cling to the basket and crocks, so that great care must be taken when overhauling them and giving fresh sphagnum, which should be done in March. When in active growth the plants should be kept moist at the root, but they must never be wetted overhead. In winter only sufficient water should be given to keep the moss from perishing. A shaded position in the hottest and moistest part of the stove is essential. These plants tax the skill of the most expert cultivators, and many fail with them entirely. A well-grown plant of *P. amabilis*, *P. schilleriana*, or *P. stuartiana*, is a magnificent picture when in flower, and a source of pride to the grower.

Description of Plate 243. *Phalænopsis schilleriana*. Fig. 1, entire plant, greatly reduced; 2, detached flower, about average size; 3 and 4, side and front views of the column (enlarged), showing the extended base; 5, the pollen-masses and heart-shaped gland.

AËRIDES

Natural Order ORCHIDEÆ. Genus *Aërides*

AËRIDES (Greek, *aer*, air: in allusion to their mode of growth). A genus of about forty species of epiphytal Orchids, mostly with handsome showy flowers. They have erect stems, and long strap-shaped, leathery leaves, regularly disposed in two opposite rows; mostly ending abruptly, and deeply channeled down the centre, though some are nearly cylindrical. Most of them throw out large fleshy roots from various heights up the stem, and by means of these moisture is absorbed from the atmosphere. The flowers, which are frequently fragrant, are distinguished by having a tail or foot to the column, and the lip spurred. They are produced in long, many-flowered racemes. The species are confined to the Tropics of the Old World.

History. This genus has long been popular with cultivators on account of the beauty and fragrance of its flowers and its good behaviour under cultural treatment. It was founded in 1790 by a Portuguese botanist on *A. odoratum*, which was introduced from Cochin-China to Kew in 1800. Many of the so-called species are of recent introduction, and some of them are very much alike.

Principal Species. AËRIDES CRASSIFOLIUM (thick-leaved). Leaves broad and thick, obliquely two-lobed, purple-dotted. Flowers white, segments tipped with rich purple; lip three-lobed, spur bent under; in long drooping racemes. Plant dwarf. Introduced from Burma, 1877.

A. CRISPUM (curled). Leaves 8 inches by 2 inches, flat, two-lobed. Flowers very fragrant, white, tinged with purplish rose, nearly 2 inches across; lip three-lobed, middle lobe large-toothed and fringed; horn-like spur, somewhat incurved; in ascending racemes nearly a foot long. Introduced from South India, 1840. The var. *Warneri* has the flowers quite white, except the lip, which is rose-coloured; the leaves are smaller and more slender.

A. FALCATUM (sickle-leaved). Leaves closely-set, leathery, blue-green. Flowers white, dotted with crimson, and rosy-tipped; lip with rosy centre: spur short; in many-flowered drooping racemes. Introduced from India. Also known as *A. Larpentæ*, *houlletianum*, *Leoniæ*.

A. FIELDINGII (Fielding's). The popular "Fox Brush" Orchid. Leaves 9 inches by 1½ inch: spike 1 to 2 feet long, densely clothed with flowers 1½ inch across, white, suffused and dotted with bright purple: lip trowel-shaped. Introduced from Himalaya in 1850.

TILLANDSIA SPLENDENS

$^1/_8$ Nat. size

PL. 252

A. LAWRENCEÆ (Lady Lawrence's). Leaves a foot long, and slender. Flowers large, wax-like, white, changing to yellowish, tipped with rosy purple; lip rosy purple in centre; spur conical, green; racemes 2 feet long, about thirty-flowered. May be called a glorified *A. odoratum*. Introduced from the Philippines, 1882. Syn. *A. sanderianum*. Plate 245.

A. MULTIFLORUM (many-flowered). Flowers white, spotted with violet, and rose-tinted towards edges; lip deep violet, with a whitish central bar; in long, dense, drooping racemes. Introduced from Moulmein, 1868. Also known as *A. affine, A. Veitchii, A. godefroyanum, A. Lobbii.*

A. ODORATUM (fragrant). Leaves oblique, with a hard point at the apex. Flowers very fragrant, white and creamy, tipped with pink; lip hood-shaped; spur conical, incurved; in many-flowered pendulous racemes. Introduced from India, 1800.

A. QUINQUEVULNERA (five wounds), A. SUAVISSIMUM (very sweet), and A. VIRENS (green). These three, which are very similar to *A. odoratum*, are other popular garden Orchids of easy culture.

Cultivation. *Aërides* require tropical conditions such as are afforded by a stove, the summer temperature in which ranges from 70° to 75°, and the winter temperature from 60° to 65°, with plenty of fresh air and a liberal allowance of sunlight. They require plenty of atmospheric moisture from March to October, and a fairly dry air in winter. Small individuals may be grown in baskets, but large plants thrive best in pots. These must be three-fourths filled with large pieces of clean, broken crocks and charcoal, and the remainder with living sphagnum pressed firmly about the roots, so that they may absorb moisture from it to supplement that obtained from the air by the upper roots. From spring till autumn—that is, during the period of growth, —water must be given freely.

Description of Plate 245. *Aërides Lawrenceæ.* Fig. 1, entire plant, greatly reduced; 2, upper part of column; 3, portion of raceme, the flowers one-third less than natural size; 4, the pollinia.

VANDAS

Natural Order ORCHIDEÆ. Genus *Vanda*

VANDA (the Hindoo name for one of the species). A genus of about thirty species of epiphytal Orchids of similar habit to *Aërides*, but differing in the structure of the flowers. The column is short, thick,

wingless, and footless, and the lip is continuous with the column, the side lobes reduced to ears, and the base swollen or spurred. They are natives of Tropical Asia, one species extending its range to Tropical Australia.

History. This genus includes some of the handsomest Orchids known. Their flowers are generally large, varied, and brilliant in colours, and they remain fresh for two or three months. Considerable variety in leaf-characters is also a peculiarity in this genus. *V. teres*, one of the handsomest when in flower, but somewhat refractory under cultivation, appears to have been the first introduced, having been brought by Dr. Wallich from Sylhet in 1829, and flowered at Syon House, Brentford, in 1836. *V. cærulea*, the queen of blue Orchids, was first introduced and flowered by Veitch in 1850. Probably more money has been spent on *V. sanderiana*, introduced in 1882 from Mindanao, and now reckoned among the most magnificent of all Orchids, than on any other of recent introduction.

Principal Species. VANDA AMESIANA (Ames'). Stems a few inches high, leaves nearly rounded. Flowers fragrant, creamy white, tinged with rose, more intense on the lip; spur conical; raceme one- to twelve-flowered. Introduced from Burma, 1887.

V. CÆRULEA (blue). Flowers as much as 5 inches across, pale blue; lip deep blue, leathery, the tip two-lobed; in erect racemes, ten- or more-flowered; autumn. Introduced from Khasia, 1849.

V. HOOKERIANA (Hooker's). Stems slender, tall; leaves short, rounded. Flowers thin-textured, $2\frac{1}{2}$ inches across, white, rosy tinged, the petals spotted with magenta; the broad lip with magenta-purple spots and lines; in two- to five-flowered racemes; September. Native of Malaya.

V. INSIGNIS (remarkable). Flowers $2\frac{1}{2}$ inches across, light brown, spotted with chocolate; lip somewhat fiddle-shaped, white and rose; in five- to seven-flowered racemes; May and June. Introduced from Timor, 1846.

V. PARISHII (Parish's). Flowers large, strongly scented, greenish yellow, dotted with reddish brown; lip magenta, with white border; raceme several-flowered, erect; June and July. Plant dwarf. Introduced from Burma, 1870.

V. ROXBURGHII (Roxburgh's). Flowers pale green, checkered with olive-brown lines; lip violet-purple and white, with short pinkish spur; racemes erect, six- to twelve-flowered; June and July. Plant dwarfish. Introduced from Bengal, 1850.

V. SANDERIANA (Sander's). Flowers about 4 inches across, pink and yellow, with a network of dull crimson lines; lip small, purple-brown

NETTED IRIS

(IRIS RETICULATA)

The large flower Nat. size

PL. 253

at tip, pale purplish red at base; three-keeled; in many-flowered racemes; September and October. Introduced from the Philippines, 1881.

V. SUAVIS (sweet). Flowers fragrant, large, white, spotted and barred with purple-red; lip rosy purple. Probably only a variety of *V. tricolor*. Introduced from Java, 1847.

V. TERES (tapering). Plant straggling or climbing; leaves terete. Flowers large, the sepals white, tinged with rose; petals and lip rosy magenta; throat orange, marked with crimson; racemes about two-flowered; June to August. Requires bright sunshine all the year round.

V. TRICOLOR (three-coloured). Flowers large, fragrant, pale yellow, spotted with brownish red; lip rose-magenta, basal lobes and short spur white; in dense, short racemes. Introduced from Java, 1846. Plate 244.

Cultivation. The directions given for the cultivation of *Aërides*, with temperatures, etc., apply equally to *Vanda*. We may add that they may be grown in baskets, as well as pots, using the same materials in similar fashion. In the event of specimens growing too tall, the upper part of the stem may be cut off in February below one or more roots, and potted separately. These plants like plenty of light, and little shading is necessary. *V. hookeriana* and *V. sanderiana* require great heat and moisture.

Description of Plate 244. *Vanda tricolor*. Fig. 1, entire plant, reduced to about one-sixth of the natural size; 2, flower, natural size; 3 and 4, front and side views of the column; 5, the pollen-masses.

LADY'S SLIPPERS

Natural Order ORCHIDEÆ. Genus *Cypripedium*

CYPRIPEDIUM (from *Kypris*, the Greek name for Venus, and *podion*, a slipper). A genus of about forty species of terrestrial Orchids with unbranched leafy stems arising from a creeping rootstock, without either tubers or pseudo-bulbs. The characteristics of the flower are a large inflated lip with turned-down edges, and a column that curves over, nearly closing the orifice of the lip and bearing at its extremity a deformed stamen, which takes the form of a dilated lobe, and has upon each side an anther-bearing process and the stalked stigma below. Instead of the solitary anther of the previously described genera, we here get two anthers, each with two cells. The flowers are either solitary or two or three in a raceme. The species are natives of

Europe, Temperate and Tropical Asia, and North America, including Mexico.

History.

The *Cypripediums* were among the first of the Orchids to be brought into cultivation, and this was accomplished with a far greater measure of success than fell to the lot of early growers of Epiphytes. The first species introduced were from North-Eastern America, and began with *C. spectabile* in 1731, followed by *C. parviflorum* (1759), *C. acaule* (1786), *C. pubescens* (1790), *C. arietinum* (1808), *C. candidum* (1826). All these have the recommendation of being hardy in this country. In the year 1816 came the first of the Indian species, *C. venustum* from Himalaya, and three years later *C. insigne* from Khasia, whilst *C. villosum* came from Moulmein in 1833. Many others have since been introduced, whose dates will be found below, as near as they are known. From the natural species, growers have succeeded in raising a large number of hybrid forms, which considerations of space prevent our inclusion here. One of the more recent introductions we must mention, because there is a little story attached to it which explains how a rapid change may occur in the market value of a new Orchid. In the year 1878 Mr. Spicer, a tea-planter of Cachar, sent home to his mother in England a box of Orchids, among them some specimens of *C. insigne*, represented in our Plate 246. When these flowered there was one, which was judged by the similarity of habit and foliage to be *C. insigne*, that differed from the others, and feeling that there was the possibility of its being a new variety of that species, Mrs. Spicer submitted it to an expert, who at once offered her £70 for her treasure, and carried it away with him. Reichenbach, the late great authority on Orchids, named the new species (as it proved to be) *C. spicerianum*, and for some time the progeny of this plant produced large sums of money. About twelve years ago as much as £170 was paid for a small specimen, and more recently £100 and £60 have been ordinary prices. But Mr. F. Sander, of St. Albans, ascertaining that it came from somewhere in Assam, sent his collector, Mr. Forstermann, to find it if possible; and this gentleman, guided by the name, thought it good policy to make for Messrs. Spicer's tea-gardens, without explaining his real business. The story goes that, having been offered the hospitality which is a characteristic of the planters, he went on a shooting expedition with Mr. Spicer, who pointed out, among other things, where grew those Orchids concerning which folks were making so much fuss at home. Forstermann brought his visit to a close and set about his real work, found the spot where *C. spicerianum* grew, though at that moment, unfortunately, a tiger was in possession, and his native helpers turned tail and left him. So much

DWARF IRIS
(IRIS PUMILA)

$^{2}/_{3}$ Nat. size

PL. 254

the worse for the tiger, however, for Mr. Forstermann not only returned with a large number of specimens of *C. spicerianum*, but with a very nice tiger-skin also, which became an ornament of Mrs. Sander's drawing-room. "Thus it happened that on a certain Thursday a small pot of *C. spicerianum* was sold, as usual, for sixty guineas, at Stevens' auction rooms; on the Thursday following all the world could buy fine plants at a guinea." To-day the amateur can possess a specimen at one-half or one-quarter that sum.

Principal Species.

CYPRIPEDIUM ARGUS (Argus'). Height 1 foot. Leaves yellowish grey, variegated with dark green. Flowers 5 or 6 inches across, white, striped with green and purple, the petals also studded with purple eye-like spots; pouch (or lip) broad, purple-brown; March and April. Stove. Introduced from the Philippines, 1873.

C. BARBATUM (bearded). Height 1 foot. Leaves irregularly blotched with darker green. Flowers solitary, white, flecked with purple; the petals with a series of shining warts along the upper edge, giving rise to tufts of black hairs; pouch blackish purple, large; spring and summer. Stove. Introduced from Malay Peninsula, 1840.

C. BOXALLII (Boxall's). Flowers one or two on a scape, greenish yellow, marked with white, and spotted with purple-brown: pouch conical, with channeled upright horns. Stove. Introduced from Burma, 1877.

C. CALCEOLUS (little shoe). Common Lady's Slipper. Height 12 to 18 inches. Flowers usually solitary, reddish brown or maroon; pouch pale yellow; May. Rare hardy native. Should be grown in compost of loam and peat.

C. CANDIDUM (white). Height 1 foot. Flowers greenish brown; pouch white; June. Hardy. Should be grown in boggy peat.

C. CHAMBERLAINIANUM (Chamberlain's). Scapes tall with hood-like bracts and numerous flowers of a dull rose colour, flushed with brown and yellow; the petals are spirally twisted, like a corkscrew. Sumatra, 1892.

C. CHARLESWORTHII (Charlesworth's). Resembles *C. spicerianum*, but the flowers are of a soft rosy mauve colour, and the upper sepal is large and flat. Burma, 1892.

C. CONCOLOR (one colour). Like *C. niveum*, but the flowers are coloured pale yellow. Stove. Moulmein.

C. GODEFROYÆ (Mrs. Godefroy's) and C. BELLATULUM (somewhat pretty) belong to the same group as *C. concolor*, but have numerous large spots of brown-purple on the white or yellow flowers.

C. HIRSUTISSIMUM (most hairy). Height 1 foot. Flowers solitary or in pairs; often 6 inches across; green, tinged with purple, and dotted

with brown; pouch greenish, dotted with brown; April and May. Stove. Introduced from Khasia, 1857.

C. HOOKERÆ (Lady Hooker's). Leaves broad, very dark green, beautifully blotched with white. Flowers solitary on long scapes, yellowish brown, tipped with rosy purple; pouch small, brown, tinged with green: summer. Stove. Introduced from Borneo, 1862.

C. INSIGNE (remarkable). Flowers about 4 inches across; yellow-green, streaked and spotted with reddish brown, shining; pouch large; December and January. Introduced from Khasia, 1819. One of the cheapest and most easily cultivated of Orchids, growing well in a cool greenhouse or dwelling-room window. Plate 246.

C. LAWRENCIANUM (Lawrence's). Height 1 foot. Leaves mottled or tesselated with dark green and yellow. Flowers usually solitary, greenish white, marked with purple veins and spots; pouch very large, purplish brown and yellow; summer. Stove. Introduced from Borneo, 1878.

C. NIVEUM (snow white). A small plant with short dark green marbled leaves and erect scapes 3 to 6 inches long, bearing one or two elegant, wax-like, pure white flowers, sometimes slightly dotted with purple. Stove. Moulmein. 1858.

C. PUBESCENS (downy). Height 1½ to 2 feet. Stem downy. Flowers large, yellowish brown, marked with darker lines; pouch pale yellow, flattened from sides; May and June. Hardy. Should be grown in light loam or leaf-mould.

C. ROTHSCHILDIANUM (Rothschild's). Scape about three-flowered, 1½ foot high. Flowers yellowish, with dark purple stripes and blotches; pouch crimson-coloured, with reddish mouth. Stove. Introduced from New Guinea, 1888.

C. SPECTABILE (showy). Moccasin flower. Leaves covered with white downy hairs. Flowers large, white: pouch much inflated, soft rich rose; June. Hardy. Should be grown in deep peat soil.

C. SPICERIANUM (Spicer's). Flowers usually solitary, 2½ inches across, white, striped with purple; pouch open, dull purple; October to December. Stove. Introduced from Assam, 1878. Can be grown with fair success in intermediate house.

C. STONEI (Stone's). Scape usually three-flowered, 2 feet high. Flowers large, white, tinged with yellow, and striped with reddish purple: pouch large, dull red, veined with purple: autumn. Stove. Introduced from Borneo, 1860. It is worthy of note that for a small plant of the var. *platytenium* Baron Schroeder paid the large sum of £325, which is believed to be the largest sum ever paid for a single Orchid.

PEACOCK TIGER-FLOWER

(TIGRIDIA PAVONIA)

$^3/_4$ Nat. size

PL. 255

C. VILLOSUM (shaggy). Flowers solitary, often 5 inches across, on hairy scapes 1 foot high; glossy, as though varnished, orange-red, varied with light green and dark purple; pouch large, light brown; May; Stove. Introduced from Burma, 1833.

Cultivation. *Cypripediums* are divided into three groups for purposes of cultivation. 1. The hardy species. These require a boggy, or at anyrate moist, somewhat shaded position, and they prefer peat soil. 2. The greenhouse species, viz. *C. insigne*, etc. These grow well when potted in a mixture of turfy loam and peat, and kept moist except for a few weeks in October and November. 3. The tropical species. Some of these are happy only when planted in peat and sphagnum, but the coarse-growing sorts thrive in loam and peat. They like plenty of water and a shaded position in a hot, moist house. The small *C. niveum* and its allies do best when some nodules of limestone are mixed with the soil. They also prefer a position near the roof-glass. In potting the plants the lower fourth of the pot's depth should be filled with clean, broken crocks, to ensure perfect open drainage. The roots of the plant should be spread out as widely as possible on the soil, and more pressed down upon them. Care should be taken that water does not lodge in the bases of the leaves, and that there is no danger of stagnant water at the roots. These plants are all propagated by division. Hundreds of named garden hybrids have been raised within the last twenty years, no genus having proved so plastic in the hands of the breeder as this. The plants grow to flowering size from seeds in about three years.

Description of Plate 245. *Cypripedium insigne.* A, upper portion of plant, with flowers of the average natural size, though they occur larger. Figs. 2 and 3 are front and side views of the column.

ARROW ROOTS

Natural Order SCITAMINEÆ. Genus *Maranta*

MARANTA (named in honour of B. Maranti, a Venetian botanist and physician, who died in 1554). A genus of about ten species of tuberous- or creeping-rooted herbs, with large sheathing leaves. The flowers have a calyx of three sepals, a corolla of six segments in two series, one of the inner series being much larger than the others. There is a single stamen, which is petal-like, and a similar but barren body, to which a hood-like style is attached. The species are natives of Tropical America, but they are widely cultivated in the East and West Indies, West Africa, etc.

History. Certain species of *Maranta*, especially *M. arundinacea*, produce the Arrow-root of commerce. This is a very pure form of starch, obtained by taking the tubers when they are about ten months old, macerating them with water, allowing the starchy matter to settle, then again washing it and allowing it to dry. The name is said to be derived from the fact that the Indians used the roots as a curative application to the wounds caused by poisoned arrows. This species appears to have been introduced from Tropical America at some date anterior to 1732; *M. bicolor* from Brazil in 1823, *M. porteana* from Bahia in 1859, *M. sagoriana* from South America, 1862, *M. smaragdina* from Ecuador in 1870, and *M. concinna* from South America in 1874. They are grown chiefly as foliage plants.

Principal Species. MARANTA BICOLOR (two-coloured). Leaves roundish oval, glaucous green, with irregular dark shiny marks between the midrib and the margin. Flowers white and violet; April to November. Plant 1 foot high. Plate 247.

M. CONCINNA (neat). Dwarf and tufted. Leaves oblique-oval, pale green, with oblong blotches of darker green at base of the principal veins.

M. PORTEANA (Porte's). Erect-growing, 3 feet high. Leaves bright green, striped with white; under-side purple.

M. SAGORIANA (Sagorian). Dwarf. Leaves oblong, very pale green, with darker bars.

M. SMARAGDINA (emerald). Leaves emerald-green, with dark stripe.

Cultivation. *Marantas* require stove treatment, with plenty of moisture and a light, open, well-drained soil, such as a mixture of loam, peat, sand, and leaf-mould in equal parts, or peat and chopped sphagnum with dried cow-manure. They are best grown in pans. There are, however, several large-growing kinds in cultivation, and these like a strong soil and a liberal allowance of pot-room. They are propagated by division. The house should be shaded from the direct rays of the sun whilst the plants are growing. The genus *Calathea* is very closely allied, and requires similar treatment. Among the most desirable species may be mentioned *C. arrecta* (erect) from Ecuador, *C. kerchoviana* (Kerchove's) from Brazil, *C. Lindeni* (Linden's) from Peru, *C. massangeana* (Massange's) from Brazil, *C. princeps* (magnificent) from Peru, *C. tubispatha* (tube-spathed) from Tropical America, *C. Vanden Heckii* (Van den Heck's) from Brazil, *C. Veitchii* (Veitch's) from Western Tropical America, *C. Warscewiczii* (Warscewicz's) from Tropical America, and *C. zebrina* (zebra-striped) from Brazil.

Description of Plate 247. *Maranta bicolor*, var. *kerchoviana*. Fig. 1, a detached flower; 2, a section of the same.

(*A*) YELLOW CROCUS (CROCUS AUREUS)

$^1/_2$ Nat. size

(*B*) SPRING CROCUS (CROCUS VERNUS)

Nat. size

PL. 256

INDIAN SHOT

Natural Order SCITAMINEÆ. Genus *Canna*

CANNA (said to be Celtic, *canna*, a cane). A genus of about thirty species of perennial herbs with large ornamental foliage, and panicles of —in many cases—brightly coloured flowers, in which the calyx consists of three small green leaf-like growths that remain on the top of the capsule; the corolla is represented by three similar but longer, green, leaf-like organs; whilst the showy parts of the flower, misnamed the petals, are really the stamens, which assume the appearance of petals, and upon only one of them is the one-celled anther. The style is also petal-like, ending in a slender stigma. The fruit is covered with rough tubercles, and when ripe splits into three divisions, setting free the hard, black, round shot-like seeds which have earned for these plants their popular name. They are natives of Tropical countries.

History. Some of these plants are important on account of the starch stored in their fleshy underground stems, and certain of these are in consequence used as vegetables. They have been in cultivation in English stoves for centuries, and are planted-out during the hottest part of the summer for sub-tropical gardening. *Canna indica* was introduced from India about 1570, *C. lutea* from the West Indies in 1629, *C. coccinea* and *C. glauca* from South America in 1731 and 1732 respectively. In 1778 *C. flaccida* was introduced from South Carolina, and *C. patens* from Rio. In 1820 *C. edulis*, which furnishes *Tous les mois*, came from Peru, and *C. speciosa* from South America. *C. Warscewiczii* came from Costa Rica in 1849. From the best of these species a considerable number of hybrids have been produced, which are horticulturally much finer than the original species: they are consequently in greater demand as garden plants. They are principally the product of *C. discolor*, *C. iridiflora*, and *C. Warscewiczii*.

Principal Species. CANNA DISCOLOR (two-coloured). Stems stout, reddish, 6 feet high. Leaves large, broad, oval-oblong; upper streaked with purple, lower tinged blood-red. Flowers red. Introduced from Trinidad, 1829.

C. INDICA (India). Indian Shot, or Indian Reed. Stems 3 to 6 feet high. Leaves large, oval-lance-shaped. Flowers large, light yellow and carmine-red.

C. IRIDIFLORA (Iris-flowered). Stems 6 to 8 feet high. Leaves

broad-oval. Flowers in drooping panicles, large, rosy, with a yellow spot on the recurved petal. Introduced from Peru, 1816.

C. Warscewiczii (Warscewicz's). Stem 3 feet high, claret-purple. Leaves oval-elliptic, tinged with dark purple. Flowers: inner segments scarlet, outer purplish.

Cultivation. As already indicated, the hybrids, of which any good firm of nurserymen will furnish a long list, will be found more brilliant and varied for the flower-garden; or seeds of the finer species may be obtained. These should be sown in March in light soil, in heat, and kept moist. They germinate in about a month, after which the plantlets grow rapidly if encouraged by liberal treatment and a stove temperature. If the weather is warm at the beginning of June, they may be planted-out in a sheltered bed or border, where the soil has been previously made very rich for their reception. Or they may be transferred to large pots—8 to 12 inches—of rich soil, and used for conservatory or dwelling-room decoration, taking care that they have frequent doses of manure-water. Seeds are rarely used except in botanical collections, as the improved varieties can only be multiplied by division. The plants grown in the open should be lifted in October and placed in a dry shed, or under a greenhouse stage out of the reach of frost: in fact, treating them as if they were Dahlias. In the following spring propagation may be effected by cutting the thick rootstock into as many portions as there are buds, and planting these separately in 3-inch pots. The best potting compost for *Cannas* consists of equal portions of well-rotted manure, loam, and sand, to which a little peat is then added.

Description of Plate 248. Indian Shot; flowers of some hybrid forms, one-half the natural size. Fig. 1 is the fruit.

KARATAS

Natural Order Bromeliaceæ. Genus *Karatas*

Karatas (name unexplained: probably the native name). A genus of about forty species, including *Nidularium*, of perennial stove herbs, stemless, with long spiny-toothed leaves, forming a rosette, within which the flowers are borne in a dense stalkless head. The individual flower is invested by an overlapping bract, and consists of a persistent three-parted calyx and a tubular three-parted corolla. There are six stamens inserted in the mouth of the corolla, and a long slender style. The fruit is

IXIA MACULATA

Nat. size

PL. 257

three-celled and many-seeded. The species are natives of Tropical America and the West Indies.

Principal Species.

KARATAS FULGENS (glowing). Leaves about twenty, strap-shaped, spreading, a foot long, green, mottled with darker green. Flowers in a large head, violet and red, surrounded by bract-leaves of a brilliant scarlet colour. The commonest and most showy species. Introduced from Brazil in 1849.

K. HUMILIS (lowly). Leaves slender lance-shaped, strongly toothed, recurved, bright green; the lower ones mealy. Flowers and bract-leaves crimson. Introduced from Mexico about 1850.

K. INNOCENTII (St. Innocent's). Leaves a foot long, strap-shaped, with toothed margins; under-side reddish purple. Flowers bright orange-red. Introduced from Brazil, 1854.

K. PLUMIERI (Plumier's). Leaves 4 to 8 feet long, slender, awl-shaped, spiny-edged. Flowers pink. Introduced from West Indies, 1739.

K. SCHEREMETIEWI (Scheremetiew's). Leaves about 1 foot long, strap-shaped, finely toothed. Flowers with white tube and violet-blue segments. The flower-cluster is surrounded by a few short leaves of a bright red colour. Introduced from Southern Brazil, 1858. Plate 249.

K. SPECTABILIS (remarkable). Leaves about twenty, strap-shaped, a foot or more long, green, tinged and banded with red-brown. Flowers in a dense head, purple and red. A popular garden plant. Introduced from Brazil in 1872.

Cultivation.

Karatas require stove treatment and plenty of moisture with sunshine. When in flower they may be removed to a warm greenhouse, or into a dwelling-room, with safety, and they will maintain their flowers in good condition for a longer period. In their native habitats they chiefly grow in the decayed vegetable matter that accumulates in the forks of the trees. It will therefore be found conducive to success if they are potted in a mixture of leaf-mould, peat, and loam, in equal parts, with the addition of a little sharp sand. The drainage must be perfect; and in order to prevent its clogging with the finer particles of soil, the layers of broken crock should be covered with moss before the compost is put in. They may be grown from seeds, treated as if they were *Gloxinias*, and potting them singly into small pots as soon as they can be handled. Each growth flowers but once, afterwards developing one or two basal suckers, which should be removed and grown on separately. All the strong-growing *Bromeliads* are best treated in this way. The old growth may be thrown away.

Description of Plate 249. *Karatas Scheremetiewi*, one-third of the natural size. Fig. 1 is an enlarged flower removed from the cluster, showing the overlapping bracts; 2, the same with bracts removed, showing the calyx; 3, a section of the same.

ÆCHMEAS

Natural Order BROMELIACEÆ. Genus *Æchmea*

ÆCHMEA (Greek *aichme*, the point of a spear: in allusion to the lobes of the calyx). A genus of about one hundred and thirty species of stove perennials with sword-shaped, or strap-shaped, leaves, and spikes or panicles of flowers supported on tall scapes. These flowers consist of a six-parted perianth, of which the outer three are sepaloid, much shorter than the inner petaloid three. Stamens six; ovary three-celled, becoming a somewhat globular berry. The general disposition of leaves is like that of *Karatas*, rosette-like, the flower-scape rising from the centre. Some of the species are epiphytal on the trunks of trees in the dense forests of South America, to which region the genus is confined.

Principal Species. ÆCHMEA CALYCULATA (having calyx). Leaves strap-shaped, 2 feet long, marginal prickles minute, pale green. Flowers bright yellow, with a false calyx of red bracts; in roundish heads on a tall scape. Introduced from Brazil, 1862.

Æ. CÆLESTIS (sky-blue). Leaves strap-shaped, 2 feet long, spiny-edged. Flowers sky-blue, in pyramidal panicles 1½ foot long; winter. Introduced from Brazil, 1870.

Æ. DISCOLOR (two-coloured). Leaves broad, with toothed edges and purple under-side. Flowers scarlet, in branching panicle; June. Introduced from Brazil, 1842.

Æ. DISTICHANTHA (flowers two-ranked). Leaves glaucous, armed with reddish brown spines, and ending in a sharp point. Flowers in panicles, with bright red bracts; sepals rose, petals purple. Introduced from South Brazil, 1852.

Æ. FASCIATA (banded). Leaves broad, banded with white; recurved. Flowers rosy pink, each with a similarly coloured spiny-edged bract; in a dense head. Introduced from Rio Janeiro, 1826.

Æ. FULGENS (glowing). Leaves somewhat sword-shaped. Flowers rich red and pink, the sepals tipped with purple-blue; panicle branching: scape deep red, with a few large membranous bracts; August and September. Introduced from Cayenne, 1842. Plate 250.

GHENT CORN-FLAG

(GLADIOLUS GANDAVENSIS)

— $^{2}/_{3}$ Nat. size

PL. 258

Æ. LALINDEI (Lalinde's). Leaves 3 or 4 feet long, broad, concave, finely toothed. Calyx green, with pink tips, the petals not showing; bracts large, crimson. Introduced from Columbia, 1867.

Æ. MARIÆ-REGINÆ (Queen Mary's). Leaves tufted, 2 to 3 feet long. Flowers tipped with blue, changing to salmon-pink; scape with many large, rose-pink, boat-shaped bracts; June and July. Introduced from Costa Rica, 1863.

Æ. SPECTABILIS (showy). Leaves strap-shaped, channeled, $2\frac{1}{2}$ feet long. Flowers rosy crimson, large. Introduced from Guatemala, 1875.

Æ. VEITCHII (Veitch's). Leaves strap-shaped, leathery, tufted. Flowers scarlet, closely invested by bracts with scarlet teeth. Introduced from Columbia, 1877.

There are many other beautiful *Æchmeas;* but as the genus is not well represented in gardens, more space need not be devoted to them here.

Cultivation. The instructions given for growing *Karatas* apply to *Æchmeas.*

Description of Plate 250. *Æchmea fulgens*, upper portion of plant, natural size. Fig. 1 is a separated flower; 2, a section of the same.

BILLBERGIAS

Natural Order BROMELIACEÆ. Genus *Billbergia*

BILLBERGIA (named in honour of J. G. Billberg, a Swedish botanist). A genus of thirty-six species of stove perennials with strap-shaped, spiny, rigid leaves, and flowers with three-parted calyx and corolla, borne in racemes or panicles, the peduncle being usually clothed with conspicuous brightly coloured bract-leaves. They are natives of Tropical America. Some of the species are exceedingly handsome both in leaf and flower. They are not popular with British cultivators.

Principal Species. BILLBERGIA IRIDIFOLIA (Iris-leaved). Leaves sword-shaped, grey beneath. Flowers red and yellow, tipped with blue; scape and bracts crimson; March. Introduced from Rio Janeiro, 1825.

B. MARMORATA (marbled). Leaves broad strap-shaped, edges toothed, green-blotched, and barred with reddish brown. Flowers deep blue; calyx green, tipped with blue; bracts large, leafy, bright scarlet.

B. NUTANS (nodding). Leaves narrow, almost grass-like, dark green, with distant spines. Flower-spike arched and bearing a loose raceme of drooping flowers. Sepals reddish, edged with blue; petals yellowish

green, with blue margin; winter. Introduced from Brazil, 1868. Plate 251.

B. PORTEANA (Porte's). A stout plant, often a yard high, with broad, folding, brown-green leaves, and arching spikes of large red bracts and green flowers. One of the most showy. Brazil, 1849.

B. SANDERIANA (Sander's). Leaves broad, leathery, armed with stout spines. Flowers green, tipped with blue; bracts rosy. Introduced from Brazil, 1885.

B. ZEBRINA (zebra-striped). Leaves brownish green, zoned and spotted with grey, forming an urn-shaped cluster 2 to 3 feet high. Flower-spike stout, nodding, clothed with large boat-shaped, rose-pink bracts, and bearing numerous greenish flowers; March and April. Introduced from South America, 1826.

About a dozen hybrids have been raised in Continental gardens, where, by the way, *Bromeliads* are much more popular than they are here.

Cultivation. The reader is again referred back to *Karatas* for particulars as to the cultivation of these plants.

Description of Plate 251. *Billbergia nutans*, one-fourth less than the natural dimensions. Fig. 1 is a section through a detached flower.

TILLANDSIAS

Natural Order BROMELIACEÆ. Genus *Tillandsia*

TILLANDSIA (named in honour of Elias Tillands, a Swedish botanist). A genus of over three hundred species of stove perennials, mostly growing upon trees or rocks, a few only terrestrial. They have narrow, undivided, spineless leaves. The flowers are borne on single or branched spikes; they are white, yellow, or purple, and consist of three erect, usually large, sepals, and three deciduous petals. The sepals are spirally twisted, the petals rolled into a tube below. The fruit is a three-valved capsule, and the seeds are surrounded by fine hairs, which assist in their dispersal. They are natives of Tropical America, a few only extending into North America.

Principal Species. TILLANDSIA CARINATA (keeled). Leaves broad, strap-shaped, with sheathing base, spreading and curved back. Flowers pale yellow, the sepals keeled; bracts green above, scarlet below; scape stout, scarlet; November. Introduced from South Brazil, 1866.

T. LINDENI (Linden's). Leaves slender, recurved; forming a rosette.

(*A*) JONQUIL (NARCISSUS JONQUILLA)

Nat. size

(*B*) DAFFODIL (N. PSEUDO-NARCISSUS)

$^3/_4$ Nat. size

PL. 259

Flowers with reddish-tipped green sepals, and bluish purple petals; bracts carmine. Introduced from the Peruvian Andes, 1867.

T. PSITTACINA (parrot-like). Leaves thin, slender, strap-shaped, inflated and recurved, yellowish. Flowers green-tipped, bracts bright red below and deep yellow above; July. Introduced from Rio Janeiro, 1828.

T. REGINA (queen). Leaves about 4 feet long, broadly sheathing at base, and recurved at the points. Flowers white, perfumed like Jasmine; bracts rose-coloured, in a branching panicle; scape about 7 feet high. Introduced from South Brazil, 1867.

T. SPLENDENS (splendid). Leaves strap-shaped, concave at base, 2 feet long, green above, paler beneath, zoned with dark fuscous irregular bands. Flowers yellow; bracts bright red, keeled. Introduced from French Guiana. Plate 252. Other genera of BROMELIACEÆ sometimes represented in gardens are: *Ananas*, to which belongs the Pine-apple; *Bromelia*, *Caraguata*, *Cryptanthus*, *Dyckia*, *Pitcairnea*, and *Puya*.

Cultivation. Generally speaking, the cultural directions given for *Karatas* apply to *Tillandsias*, though the stronger-growing species, like *T. regina* and *T. splendens*, require a richer soil than there prescribed. For these substitute a compost of fibrous loam, rotted manure, and a little peat. *T. carinata*, *T. Lindeni*, and *T. psittacina* do better in loam, peat, and leaf-mould, with the addition of a few crushed bones. Plenty of heat and sunlight, good drainage, abundant water in the growing period, with syringing twice a day, are main points in the successful growing of these plants. In botanical collections—at Kew, for instance—the genus is largely represented, and some of the species are widely different from those here described, the whole plant in some instances being only an inch or two high. The plant known as "Spanish Moss," or "Old Man's Beard," is a *Tillandsia*, i.e. *T. usneoides*. The small species are grown in baskets along with tropical Orchids.

Description of Plate 252. *Tillandsia splendens*, reduced to one-eighth of the natural size. Fig. 1 is a detached flower and bract; 2, a section through the flower; 3, a cross-section of the ovary, showing the divisions; 4, a few of the seeds (enlarged) in their natural position in the ovary.

IRISES

Natural Order IRIDEÆ. Genus *Iris*

IRIS (Greek name for the rainbow: in allusion to the diverse colouring). A genus of about two hundred species of mostly hardy herbaceous

perennials, with creeping or tuberous rootstocks, leaves chiefly radical and sword-shaped, or grass-like, and flowers of peculiar structure and splendid colours, borne on a scape and at first enclosed in a sheath (*spathe*). The flower is a six-parted perianth with a short tube. The sepals are large, turned back, and supported on a short channeled footstalk; the petals smaller, more erect, also stalked, the edges of the footstalk turned in. The stamens are attached to the sepals. The ovary is three-angled and supports a stout style, which divides into three broad petal-like stigmas. These arch over the sepals, and bear a plate along the centre of the inner surface, against which the anther lies; the stigmatic surface is a point just below this surface. The fruit is a leathery three-celled capsule, containing many large flat or globular seeds. In horticultural literature, trade lists, etc., it is customary to speak of the petals as "Standards," of the sepals as "Falls," and the expansion of the stigma is the "Limb." The species are natives of the Temperate Regions of the Northern Hemisphere; two British.

History.

The native species of *Iris* are the Yellow Water-flag *I. pseudacorus*, so plentiful in marshy ground, by river-sides, etc., and the Gladdon or Roast-beef plant, *I. fœtidissima*. Both these are used as garden plants; but, not content with these, we have for centuries been growing several exotic species, and in recent years we have seen the introduction of many new species and the rising up of the Iris amateur, who makes a specialty of growing all the finest Irises the world produces, just as his brother amateur makes a specialty of Orchid-growing. The consequence is this: Irises, like Orchids, though of course in a minor degree, require a volume to themselves; we cannot pretend here to give a full list of even the most desirable species. It is interesting to note that the exotic species first introduced to Britain, three hundred years and more since, are still held in high favour by growers. Of these, the commonly cultivated *I. germanica* was introduced from the Continent at some date prior to 1573. Professor Michael Foster says truly of it: "The plant is one that appears to be—and to have long been—a favourite of man. You will find it in the gardens of nearly all civilised nations along the Temperate Zone; it adorns the cottage of the English labourer and the walls of the Persian town. It has been brought to the English garden from abroad, but the French or Italian peasant has often transferred it from the mountain rock to his house-side." In addition, there were growing in English gardens three centuries ago the following species that will be found in any good collection to-day:—*I. biflora, I. florentina, I. graminea, I. pallida, I. pumila, I. sibirica, I. susiana, I. variegata, I. Xiphion.* The genus is

POLYANTHUS NARCISSUS

(NARCISSUS TAZETTA, *vars.*)

Nat. size

PL. 260

divided into two sections: 1st, Irises proper, with rhizomes; 2nd, Spanish Irises, or *Xiphions*, with bulbous roots. They will be so separated below.

Section I. Irises proper:

Principal Species.

Iris biflora (twice-flowering). Leaves sword-shaped, somewhat glaucous. Flowers violet-purple: sepals egg-shaped, with yellow beard; twice flowering, spring and autumn. Introduced from Portugal, 1596.

I. florentina (native of Florence). Leaves few, glaucous, sword-shaped, tufted. Flowers fragrant; sepals white, tinged with lavender, the claw veined with green and brown, beard bright yellow; petals white; May; 2 to 3 feet high. Native of South and Central Europe. The scented rhizome is known in pharmacy as Orris-root = Iris-root.

I. fœtidissima (most fœtid). Stinking Gladdon or Gladwyn. Leaves firm, sword-shaped. Flowers variable in colour and form, but normally 3 inches across, with blue-purple sepals and yellow petals and stigmas; May to July. Scape leafy, 1 or 2 feet. Native of Britain.

I. germanica (German). Common Iris (of gardens). Leaves few, tufted, sword-shaped, glaucous. Flowers fragrant, sepals bright purple, claw white, brown-veined, beard bright yellow; petals deep lilac; four or five flowers in a cluster; May. Scape 2 or 3 feet high; glaucous. Native of South and Central Europe.

I. graminea (grass-like). Leaves very slender, about four or five in a tuft, much longer than the scapes. Flowers slightly fragrant, sepals dull yellow, claw white, purple-veined; stigmas lilac-purple; petals purple; two or three flowers in a cluster; May. Scape about 9 inches high. Native of Central and South Europe.

I. iberica (Iberian). Leaves few, slender, sickle-shaped, glaucous, tufted. Flowers solitary; sepals lilac-purple, closely veined with purple-brown; petals satiny white or lilac; summer. Scape 3 to 6 inches high. Native of the Caucasus.

I. lævigata (smooth). Japanese Iris. Leaves thin, narrow, sword-shaped, pale. Flowers in single clusters, opening one at a time, purple; sepals with bright yellow blotch at the throat; June. Stem firm and solid, 1½ to 2 feet high. Native of Siberia and Japan. Also known as *I. Kæmpferi.*

I. Lortetii (Lortet's). Leaves few, sword-shaped. Flowers solitary, very large; sepals creamy yellow, heavily spotted with crimson; petals pale rose, delicately veined with violet; very beautiful; May. Native of Lebanon.

I. neglecta (neglected). Leaves sword-shaped, slightly glaucous, purple at the base, 12 to 15 inches long. Sepals pure white, with many

lilac stripes, beard yellow; petals bright lilac; June. Stem about 2 feet high. Native country unknown. Many varieties.

I. PSEUDACORUS (bastard Acorus). Yellow Iris. Leaves sword-shaped, glaucous. Flowers orange-yellow; sepals with deeper patch in the throat, from which radiate brown veins; April and May. Stem 2 or 3 feet high. Native.

I. PUMILA (dwarf). Leaves about four, sword-shaped, slightly glaucous. Flowers solitary, bright lilac-purple; sepals deeper purple, with a dense white beard; April. Scape very short. Native of Europe and Asia Minor. Plate 254.

I. SIBIRICA (Siberia). Leaves slender, ribbed, tufted, 1 foot to 2 feet long. Flowers in twos or threes; sepals extensively veined with violet on a paler ground; petals shorter than sepals; stigma lilac-blue; May and June. Native of Siberia.

I. SUSIANA (native of Susa). Leaves sword-shaped, stem-clasping. Flowers solitary, grey, or white, delicately tinged with lilac; sepals and petals of similar size and shape, but petals of somewhat brighter tint, both spotted and veined with purple-brown; April. Native of the Levant.

I. VARIEGATA (variegated). Leaves sword-shaped, purple-based, tufted, 12 to 18 inches long. Flowers in clusters; sepals deep claret-brown, above paling to yellow in the middle, veined with brown and bearded with yellow; petals lemon-yellow; May. Native of Eastern Europe. Many varieties.

Section II. XIPHIONS.

I. ALATA (winged). Leaves lance-shaped, about 10 inches long. Flowers fragrant, pale blue; sepals with yellow throat; October to December. Introduced from the Mediterranean Region, 1801.

I. HISTRIO (actor). Leaves slender, grass-like, in pairs, a foot long. Flowers solitary, from between the pair of leaves, lilac: sepals with spots and streaks of deeper colour and central line of yellow; petals without markings; February. Introduced from Palestine, 1873.

I. PERSICA (Persian). Leaves slender, recurved, 2 or 3 inches long, four or five in a tuft. Flowers with the fragrance of violets, yellowish lilac; sepals with wavy edges and a central stripe of bright yellow; February and March. Native of Persia and Asia Minor.

I. RETICULATA (netted). Leaves very slender, four-angled, hollow, about 6 inches, as long again after flowering; about two in a tuft. Flower solitary, fragrant, deep violet-purple; sepals with a central yellow stripe and darker markings: February and March. Native of Asia Minor, etc. Plate 253. There are several varieties.

SCARBOROUGH LILY

(VALLOTA PURPUREA)

$^{2}/_{3}$ Nat. size

PL. 261

I. XIPHIUM (Spurge-wort). Spanish Iris. Leaves slender, half round, deeply channeled. Flowers solitary, or twin; purple; June. Introduced from Portugal prior to 1596. Also known as *I. vulgare*. The var. *lusitanicum* has yellow flowers suffused with brown.

I. XIPHIOIDES (Xiphium-like). English Iris. Leaves half-round, deeply channeled. Flowers deep lilac-purple; July. Native of Pyrenees. Also known as *I. anglica* and *Xiphion latifolium*.

Cultivation. Most species of *Iris* in general cultivation may be grown without special care beyond what is usual in the treatment of hardy perennials. They will be found to do best on a well-drained rockery. Irises proper must be planted with their rhizomes merely pressed into the soil, and *the roots* only spread out and buried in light rich (not too rich) loam. The situation must be a sunny one, and where in winter they may be protected from the too abundant rains by frame-lights being propped on four stakes up over them, so that the rain is thrown off, and the air allowed free play. *I. Pseudacorus* and *I. sibirica* need moister conditions, and the ground may be made boggy for them. *I. lævigata* is cultivated by the Japanese as a sub-aquatic, and here it is frequently grown with success in pans which are stood in an inch or two of water. *I. susiana* is a bit sensitive, and in colder parts of the country will demand winter protection; it should be wintered in a frame with well-drained light soil, and with sharp river sand in immediate contact with the rhizome. *I. fœtidissima* is an exceptional species in that it thrives in shade. The bulbous section, or *Xiphions*, should be planted in a shrubbery border, fully exposed to as much sun as shines in Britain, but protected from cold winds. The soil should be a light sandy loam, and the tuberous roots should be inserted with the crown about three inches below the surface. Some of them lend themselves well to pot culture.

Propagation is usually effected by dividing the roots in the rhizomatous section; or by separating the offsets from the bulbs of the other section, when they have got large enough. Or they may be reared by sowing the seed in pans of sandy soil, as soon as ripe, and germinating in a cold frame.

Description of Plates 253 and 254. Plate 253. *Iris reticulata*, or Netted Iris. The plant, etc., reduced about one-half; the separate flower the natural size. Fig. 1 is a detached sepal; 2, the stigma, or "limb," with the stamen lying against it.

Plate 254. *Iris pumila*, or Dwarf Iris. Fig. 1, a detached flower, is about two-thirds of the natural size; 2 is the "limb" with accompanying stamen.

TIGER FLOWERS

Natural Order IRIDEÆ. Genus *Tigridia*

TIGRIDIA (Greek, *tigris*, a tiger, and *eidos*, likeness: from the spotted flowers). A genus of about eight species of half-hardy perennial herbs with Crocus-like rootstalk, and plaited sword-shaped leaves. The flower is at first enclosed in a spathe as in *Iris*. The three outer segments are much larger than the inner three. The filaments of the three stamens are united throughout their length to form a tube, through which passes the style; the anthers are free at the summit of the tube. The ovary is three-celled, and develops into a thin-textured capsule. Each flower lasts a very short time. The species are natives of Mexico, Central America, Chili, and Peru, at high altitudes.

History. The names of these plants have been suggested by the plentiful spots and streaks on the flowers, especially those of *Tigridia Pavonia*, which was the first species to be introduced —from Mexico, in 1796. *T. violacea* came next, from Southern Mexico, in 1838, and five years later three new species arrived—*T. atrata* from South Mexico, *T. curvata* from Real del Monte, and *T. lutea* from Peru. *T. Van Houttei* was introduced from South Mexico in 1875, and *T. Pringlei* from Peru in 1888.

Principal Species. TIGRIDIA ATRATA (black). Stem 2 feet high; leaves plaited, 12 to 18 inches long. Flower dark purple; sepals with green-spotted claw and dark brown blade; April.

T. PAVONIA (peacock). Peacock Tiger Flower, or Flower of Tigris. Stem 1 to 2 feet high. Leaves plaited, sheathing at base. Flowers three to a spathe, scarlet spotted with orange; June to September. There are several good varieties. The var. *conchiflora* (Plate 255) is orange, spotted with scarlet; var. *grandiflora* is bright crimson; *grandiflora alba* is creamy white, spotted with rich lake; *canariense*, bright yellow, spotted with scarlet: *speciosa*, dark scarlet, spotted with yellow.

T. VAN HOUTTEI (Van Houtte's). Stem branched, 1 foot high. Leaves plaited, few. Flowers, 2 inches across, blotched and veined with purple; ground-colour of sepals yellow, of petals lilac; spring.

Cultivation. *Tigridias* being half-hardy perennials, require to be lifted and kept in a frost-proof shed or under the stage in a greenhouse during winter. They are grown at Kew as follows:— In March the corms are planted in sunny borders of light rich soil, in which they are set 3 inches deep and about 3 inches apart. In very

JACOBEAN LILY

(SPREKELIA FORMOSISSIMA)

—

1/2 Nat. size

PL. 262

dry weather they receive water. In October they are lifted and slowly dried in baskets in the sun, and afterwards buried in boxes of sand, which are then placed under a stage in a cool-house. Seedlings are easily raised from spring-sown seeds in a little warmth, and pricked out in a sunny frame. They flower when two years old. For pot culture the bulbs should be planted early in the year, and the pots placed in a cold frame, giving no water until the leaves begin to appear, when it may be given in small quantities, to be gradually increased with the growth of roots and development of the plant.

Description of Plate 255. *Tigridia Pavonia.* The plant depicted is the var. *conchiflora.* The partially open flower shows the early condition of the stamens, the stigmas not having yet pushed through the staminal tube. Fig. 1 is a vertical, and 2 a transverse, section through the ovary; 3 is the bulbous root.

CROCUSES

Natural Order Irideæ. Genus *Crocus*

Crocus (the ancient Latin and Greek name for Saffron). A genus of about seventy species of perennial herbs with rootstalks in the form of a corm; no stem; leaves radical, long, slender, grass-like, channeled above, white beneath, the edges turned back, and the lower portion of the leaf-bundle surrounded by sheaths of thin, translucent, whitish tissue. Flowers solitary or in bundles, enclosed in a spathe; perianth large, tube very long; the six segments equal in form and almost in size, but the inner ones are invariably somewhat shorter than the outer; concave, narrow-oblong. The stamens are attached to the bases of the outer segments, the filaments free. The ovary is hidden between the bases of the leaves, underground, and is egg-shaped; the style thread-like, branching into the three stigmas, which are again variously divided according to species. Capsule spindle-shaped, seeds roundish. The species are natives of Europe, North Africa, and North and West Asia.

History. Three species of Crocus have been cultivated in gardens for so many centuries that we have lost all record of their introduction. These are *C. nudiflorus*, *C. sativus*, and *C. vernus*—all occurring naturally in Europe, and now found naturalised locally in England. *C. susianus*, the very early and brilliant Cloth of Gold Crocus, was introduced from the Crimea in 1605. *C. aureus*, the

parent of the "Dutch Yellow" garden Crocus and several well-known varieties, was cultivated here as long ago as 1629, about which time it was introduced from South-Eastern Europe. About the same period *C. biflorus* was introduced from the Crimea, *C. minimus* from Corsica, *C. serotinus* —whose native country is unknown—from Europe, and *C. versicolor* from Southern Europe. The species that have chiefly produced the fine florists' varieties of Crocus, so extensively used for spring decoration of beds and borders, are *C. aureus*, *C. biflorus*, *C. susianus*, *C. vernus*, and *C. versicolor*. Many of these varieties are hybrids, which, by the natural process of corm-multiplication, come true year after year. The principal autumn-flowering species are *C. Boryi*, from the Ionian Isles, *C. iridiflorus*, from Eastern Europe, *C. nudiflorus*, *C. sativus*, and *C. speciosus*, the latter from Asia Minor. With few exceptions the so-called species of the dealers' catalogues are mere garden varieties. *C. sativus* produces the Saffron of commerce, which consists of the pressed anthers.

Principal Species

Crocus aureus (golden). Leaves very slender, with whitish line, from wide basal sheaths. Flowers bright orange; February and March. Also known as *C. luteus*, *C. lagenaflorus*, and *C. mesiacus*. Plate 256A.

C. biflorus (two-flowered). Leaves slender, short, with distinct white line. Flowers variable, from white to pale lavender; outer segments feathered with purple outside, yellow within; February and March. Several good varieties.

C. Boryi (Bory's). Leaves narrow, smooth. Flowers creamy white, with orange throat; base outside streaked with purple; late autumn, leaves appearing a little earlier.

C. Imperati (Imperato's). Leaves thick, with distinct white line. Flowers fragrant, lilac-purple, the outer segments marked with three dark purple lines; March. Native of Southern Italy.

C. iridiflorus (Iris-flowered). Corm small, somewhat flattened. Leaves rather broad, appearing in spring. Outer segments of flower, rich purple; inner ones much smaller, pale lilac; stigmas purple; September and October. Native of Eastern Europe.

C. nudiflorus (naked-flowered). Leaves appearing in spring. Flowers appearing in autumn; pale purple or violet. Corm sends out thick lateral shoots, which ultimately develop into new corms. Also known as *C. fimbriatus*, *C. multifidus*, and *C. pyrenæus*.

C. sativus (cultivated). Saffron Crocus. Corm large, globular, depressed. Leaves fringed along margins and keel. Flowers fragrant, violet marked with lighter or deeper tints; throat hairy; autumn.

CLIVIA MINIATA

$^{3}/_{4}$ Nat. size

PL. 263

C. SPECIOSUS (showy). Corms nearly round. Leaves broad, keel prominent, appearing about same time as flowers. Flowers large, bright lilac, striped within with deep purple; autumn. The finest of the autumnal species.

C. SUSIANUS (Susian). Cloth of Gold Crocus. Leaves fringed along margins and keel. Flowers deep orange, outer segments usually feathered with deep brown; February. One of the earliest to appear. Also known as *C. revolutus.*

C. VERNUS (spring). Leaves ¼ inch broad, appearing with flowers. Flowers ranging in colour from pure white to deep purple (never yellow), throat always hairy; spring. **Plate 256B.**

C. VERSICOLOR (various colours). Leaves smooth. Flowers varying from purple to white; self-coloured or purple-veined; spring. Also known as *C. fragrans.*

Named Varieties. These are very numerous; the following very brief selection includes the best known and most popular:—

Cloth of Silver, white, striped with lilac, early.
Golden Yellow, abundant-flowered, large.
John Bright, large, dark purple, early.
King of the Blues, very large, rich purple-blue.
La Majestueuse, large, white, striped with lilac.
Mont Blanc, large, pure white, fine form.
Prince Albert, dark blue-violet.
Purpurea Grandiflora, rich deep purple, very large.
Queen Victoria, pure white, large.
Sir Walter Scott, large, white striped with lilac.

Cultivation. Crocus corms having sufficient material for a season's flowering stored within them, will flower successfully almost anywhere; but to enable them to recuperate and increase after flowering, instead of dwindling, they should be planted in a well-drained light soil, with a warm, sunny aspect. Where it is desired to utilise the corms in successive years, the leaves should be allowed to ripen and wither before taking them up. Some amateurs, annoyed by their unsightly appearance in summer, cut them off, thereby causing the corms to deteriorate. The unsightliness of the long yellowing leaves may be minimised by lightly twisting them into a loose knot. The corms should be planted between September and November at a depth of 3 inches, the distance apart depending on taste. They may be in single lines, several parallel rows, small clumps or large masses. Some of the strong-growing kinds, such as the *Yellow Dutch*, *King of the Blues*, and *Mont Blanc*, may be planted on lawn slopes or banksides, where they have a charming effect when in flower. They should be planted irregularly by means of a pointed iron crow-bar, making the hole 6 inches deep

dropping a corm in each, and filling up with fine soil. Thus treated, they take care of themselves, and flower regularly for years. If grown in pots, the corms should be in contact to get the best effect, and the soil should be light and rich. Where the corms are not required to be saved, they may be flowered in pots or vases of moss, or cocoanut-fibre; and for table decoration they may be grown in shallow saucers of water, a large number of corms being placed closely together. If planted in beds or borders at a distance of a couple of inches apart, it will not be necessary to take them up for several years—in fact, not until they have obviously become crowded. They propagate themselves by the production of several corms in place of the one that flowered; but many of them produce abundant seed in this country, which should be sown thinly in beds or pans of light sandy loam. They will not germinate until the season for the sprouting of the old corms; and they should be left until they have completed two seasons' growth before being used as flowering corms.

Description of Plate 256. A, *Crocus aureus*, the Yellow Crocus. B, *Crocus vernus*, the Spring Crocus. Fig. 1, stamens, back and front aspects; 2, the ovary and stigmas of *C. vernus*.

IXIAS

Natural Order IRIDEÆ. Genus *Ixia*

IXIA (Greek *ixios*, bird-lime: in allusion to the sticky juice). A genus of about twenty-five species of greenhouse bulbous perennials with sword-shaped leaves, and salver-shaped flowers in simple or branched spikes. There is a long slender perianth-tube and six-parted limb, three stamens inserted in the throat, a three-celled ovary terminating in a thread-like style, with three slender recurved stigmas. They are exclusively South African plants, whence most of them were first introduced in the latter half of the 18th century. They have been crossed and considerably improved by the Dutch growers, with whom they are still a speciality.

Principal Species. IXIA MACULATA (spotted). Flower stems 1 foot high. Flowers orange with purple-violet centre: April and May. Introduced 1757. Plate 257. The var. *ochroleuca*, shown to the left of the plate, has cream-coloured flowers in a shorter, denser, more head-like spike.

I. ODORATA (fragrant). Height, 1 foot. Flowers strongly scented, yellow, in many-flowered spike; May and June. Introduced 1757.

IXIOLIRION MONTANUM

Nat. size

PL. 264

I. PATENS (spreading). Height, 1 foot. Flowers pink, somewhat bell-shaped, the segments spreading; April. Introduced 1779.

I. SPECIOSA (showy). Height, 6 inches. Flowers dark red, bell-shaped; May and June. Introduced 1778.

I. VIRIDIFLORA (green-flowered). Height, 1 foot. Flowers green, with blue centre; May and June. Introduced 1780.

Cultivation. In the most southern portions of England, and in sheltered spots, *Ixias* are hardy, and may be grown outside. Given a well-drained, warm, sunny border in a sheltered position, in many other parts they may be grown successfully, if during the winter they are protected from frost by piling fern or cocoanut-fibre thickly above them. The bulbs should be planted in October, at a depth of 4 or 6 inches, and the soil should be light and sandy. Except in warm sheltered gardens, it is best to lift the bulbs after they have flowered, and ripen them by exposure to air and sunshine. For pot-culture the soil should be a mixture of leaf-mould and sandy loam. A 5-inch pot is the most suitable size, and in this from eight to twelve bulbs may be placed, with the crowns an inch below the surface. Stand on or plunge in ashes in a cool frame, and merely keep the soil from drying until the flower-spikes appear. Then give more water, and remove the plants to a cool greenhouse or conservatory where they will get abundant light and air. After flowering, ripen gradually by placing them outside and watering moderately till the leaves have died away; then keep soil dry and store away till October, when they should be repotted. Propagation is effected by separating the bulbous offsets when large enough, or by sowing seeds in sandy soil about September, germinating them in a cool frame. The seedlings are not of rapid growth, and they will not be fit for removal for a year, when they may be potted singly, but they will not flower until three or four years old.

Description of Plate 257. *Ixia maculata*, natural size. The short spike figured at the left of the plate is the var. *ochroleuca*.

GLADIOLUS OR CORN FLAG

Natural Order IRIDEÆ. Genus *Gladiolus*

GLADIOLUS (Latin, a dagger or sedge: in allusion to shape of leaves). A genus of about one hundred and thirty species of perennial herbs with corms, and linear or sword-shaped leaves. The flowers are borne in a two-rowed spike on a tall scape, and consist of a six-parted, somewhat

two-lipped perianth, with short, curved tube and oval unequal segments. The three stamens are inserted on the perianth tube; the ovary is egg-shaped, the style thread-like, with three stigmas. The capsule is leathery, three-celled, containing many seeds. Fifteen species are natives of Europe and Western Asia, the others being natives of the Cape and Tropical Africa.

History. Three hundred years ago only the European species of *Gladiolus* were known here, including *G. communis* (of which our Hampshire *G. illyricus* is regarded by Hooker as a variety) and *G. segetum*. In 1629 *G. byzantinus* was introduced from Turkey, but most of the others came from the neighbourhood of the Cape of Good Hope, as witness this list of South African species, with the dates of introduction: *G. tristis*, 1745; *G. recurvus*, 1758; *G. vittatus*, 1760; *G. blandus*, 1774; *G. floribundus*, 1788; *G. cardinalis*, 1789; *G. grandis*, 1794; *G. cuspidatus*, 1795; *G. papilio*, 1866; *G. cruentus*, 1868; *G. purpurea-auratus*, 1872. *G. brachyandrus* came from Tropical Africa in 1879. But these species, though beautiful in themselves, are little grown compared with the favour accorded to their hybrid progeny, for which we were indebted in the first instance to the Belgian, Dutch, and French growers. The most important of these in size and brilliance of its flower-spikes, as well as in the endless list of variations constantly being produced from it, is the *G. gandavensis*, or Ghent Gladiolus, produced about sixty years ago by crossing—it is said—*G. cardinalis* with *G. psittacinus*. The credit of this production is given to M. Bedinghaus, gardener to the Duke of Arenberg, and its introduction to the larger world of gardeners was due to the well-known house of Van Houtte. *G. brenchleyensis* is of similar origin, and has also produced many varieties. *G. Colvillei* is another hybrid, the result of the union of *G. cardinalis* and *G. tristis*; its var. *alba*, well known as The Bride, is very popular for pot-culture and cut flowers. More recently M. Lemoine of Nancy produced a hybrid between *G. gandavensis* and *G. purpurea-auratus*, which is known as *G. Lemoinei*, and from which a race has arisen with more brilliantly coloured flowers, and a purplish brown blotch on the lower segments. Yet more recently the same hybridiser has produced the race called *G. nancieanus* by crossing *G. Saundersii* with *G. Lemoinei*; these produce flowers of great size, surpassing all earlier sorts in this respect. The principal grower and breeder of the large-flowered *Gandavensis* section is Mr. James Kelway of Langport.

Principal Species. GLADIOLUS BRENCHLEYENSIS (Brenchley's). Flowers bright scarlet; July and August. Height, 4 or 5 feet.

TUBEROSE

(POLIANTHES TUBEROSA)

Nat. size

PL. 265

G. BYZANTINUS (Byzantine). Leaves slender, deep green. Flowers red, nodding, in many-flowered spikes, 2 feet high; June.

G. CARDINALIS (cardinal colour). Leaves many-nerved. Flowers somewhat bell-shaped, fine scarlet, with large white spots; flower stems 3 to 4 feet high; July and August.

G. COLVILLEI (Colville's). Leaves slender, strongly nerved down centre of each side. Flowers bright red, with pale purple markings; July. Stem somewhat zigzag and angular, leafy, 1½ foot high. Garden hybrid, 1824. The var. *alba* has white flowers, and is known as The Bride.

G. GANDAVENSIS (Ghent). Flowers of many shades of scarlet and crimson, from the deepest tones to pure white, marked and streaked with lilac, pink, yellowish, and other tints; July. Flower stem 4 feet high. Hybrid. Plate 258.

G. PSITTACINUS (parrot-like). Flowers rich scarlet, streaked and spotted with yellow; August to October. Flower stem 3 feet high.

G. PURPUREA-AURATUS (purple and gold). Flowers golden yellow, with a large purple blotch on the two lower segments; August. Height, 2 or 3 feet.

G. SAUNDERSII (Saunders'). Flowers crimson, spotted with white; autumn. Height, 2 or 3 feet.

Garden Varieties. These are now so numerous—hundreds of them being catalogued by nurserymen—and so generally excellent, that it would serve no useful purpose to give a list of them. So good has the general quality of these become, that many amateurs prefer to buy unnamed seedlings from reliable houses, and probably secure better results than purchasing named varieties from very brief descriptions.

Cultivation. *Gladioli* like a deep, light, loamy soil, made rich by the addition of manure four or five months before the corms are planted. Planting commences in March, and batches may be put in at intervals until May, to secure a succession of flowers. The corms should be put at least 3 inches below the surface and a foot apart. In so doing, care should be taken that no fresh manure comes in contact with the corm, or decay will probably result. It is a good plan to place the corms on a layer of mixed sand and wood ashes. During hot, dry weather in summer, a mulching of well-rotted manure will be of great assistance. After flowering, if there is no desire to save seed, the stem should be cut off just below the lowest flower, and before the approach of frosts the entire plants of the South Africans and the tender hybrids should be taken up and laid in a dry, airy place until the stems and leaves die off. Then these should be cut off about an inch above the

corm, and the latter, if quite dry, stored away in paper bags, or boxes of dry sand, in a dry shed. Numerous little corms are produced around the old one, and these should be separated when the old ones are put away, and the following year they should be grown in pans. In their second year they may be planted-out, and will probably flower. The stock may also be increased by means of seed, sown in pans in March, started in heat, the seedlings gradually given more air and less heat until they can be turned outside for the summer. Ripen and dry off in autumn, and plant out the following March. *Gladioli* may also be grown in pots. Use a 6-inch pot, and place corms in according to the usual size of the species when grown. Thus a single corm of *G. Lemoinei* or *G. nancieanus* will be sufficient, but the same size pot will take half a dozen corms of *The Bride*. The soil for potting should have been made rich well in advance.

Description of Plate 258. Ghent Cornflag, *Gladiolus gandavensis*, about one-third less than the actual size; showing corms, leaves, and flowers.

Other genera of IRIDEÆ which are represented among garden plants are: *Babiana*, something like Ixia, but with hairy leaves and short flower-spikes; *Freesia*, with the habit of Ixia, and slender spikes of tubular fragrant flowers; *Morœa*, very similar to Iris; *Schizostylis*, an autumn-flowering Ixia-like plant with bright crimson flowers; *Sparaxis*, with tall spikes of elegant tubular flowers; *Tritonia*, another Ixia-like genus, of which *T. Pottsii*, crossed with the allied *Crocosma aurea*, has produced a most useful race of summer-flowering, easily-grown, half-hardy plants: *Watsonia*, a near ally of Gladiolus. These genera are all natives of South Africa.

NARCISSI

Natural Order AMARYLLIDEÆ. Genus *Narcissus*

NARCISSUS (the old Greek name). A genus of (according to Bentham and Hooker) about twenty species of bulbous perennial herbs, mostly hardy. They have narrow strap-shaped or Rush-like leaves, and flowers solitary or in umbels, at first included in a membranous spathe, and always white or yellow. The perianth forms a tube below, with six spreading segments above, the mouth of the tube surmounted by a circular crown. There are six stamens inserted in the tube, and not protruding beyond the crown. The ovary is three-sided, below the

ASPIDISTRA LURIDA

$^1/_2$ Nat. size

PL 266

perianth, and the thread-like style ends in a blunt stigma. The seed vessel is a leathery capsule, containing numerous globose seeds. The species are natives of Europe and Northern and Western Asia; one British.

History. Our native Daffodil, or Lent Lily, *Narcissus Pseudo-narcissus*, has always been a favourite garden flower. Theophrastus of Eresus, who lived B.C. 371–286, describes the *Narkissos*, and speaks of its seed being gathered by some persons "for sowing." The Poet's Narcissus, *N. poeticus*, from South Europe, appears to have been the first of the foreign species to be introduced, but so long ago that the date is not recorded. The Jonquil, *N. Jonquilla*, was introduced from Spain some time previous to 1596. The Hoop-petticoat Narcissus, *N. Bulbocodium*, and the *N. triandrus*, both from Portugal, had both been introduced before 1629, for Parkinson refers to them as growing here, in his *Paradisus*, published at that date. The Polyanthus Narcissus, *N. Tazetta*, came from Spain in 1759. Many others have been introduced; but we pause here to remark that, in the opinion of Mr. F. W. Burbidge, F.L.S., who has devoted great attention to the study and cultivation of the genus, these six are the only real species that are known to science, and that the other forms that rank as species in most works are natural hybrids, or natural varieties of them. He says: "All these are known to exist as plants undubitably wild in Europe, and they all vary more or less widely as collected from different localities. All come true from seed if fertilised with pollen of another individual of the same species, and they hybridise so freely with each other, that given these six wild species alone in sufficient quantity and variety, and from them the hybridist and cultivator could stock our gardens with every garden variety of Narcissus now known and worth growing" (*Journal Roy. Hort. Soc.*, xi. 79). In the true species the stamens are attached either at the base of the tube (*N. Pseudo-narcissus* and *N. Bulbocodium*), or near its mouth in two series (*N. poeticus*, *N. Tazetta*, *N. Jonquilla* and *N. triandrus*). In the hybrid forms the stamens are attached more or less half-way down the tube.

Principal Species. Narcissus Bulbocodium (Bulbocodium-like). Bulb about two-thirds of an inch thick. Leaves slender, half-round, two or three to each scape. Flowers bright yellow, funnel-shaped, gradually enlarging from base of perianth to mouth of crown, divisions of perianth very narrow; margin of crown slightly crisped; scape one-flowered, round, 4 to 8 inches high; April and May. Several varieties.

N. Jonquilla (Jonquil). Bulb somewhat less than 1 inch thick.

Leaves channeled, one or two to each scape. Flowers bright yellow, very fragrant; divisions of perianth spreading and slightly overlapping; crown very shallow, saucer-shaped, the edge faintly round-toothed; scape almost round, slender, 8 to 12 inches high, two- to six-flowered; April. Plate 259A. Queen Anne's Jonquil is a double variety of this. Several varieties.

N. POETICUS (Poet's). Bulb about 1 inch thick. Leaves flat, bluntly keeled, somewhat glaucous, three or four to a scape. Flowers 2 inches across, agreeably scented; perianth white; crown saucer-shaped, the margin crisped and coloured a bright red; scape two-edged, one- (rarely two-) flowered, 12 or 14 inches high; April. Several varieties.

N. PSEUDO-NARCISSUS (False or Bastard Narcissus). Bulb about $1\frac{1}{4}$ inch thick. Leaves glaucous, nearly flat, five or six to a scape. Flowers at first erect, then drooping; perianth pale yellow; segments lance-shaped; crown as long as perianth-segments, but deeper yellow, an inch across, the margin slightly crisped and boldly toothed; scape two-edged, 1 foot high, one-flowered; February or March. Plate 259B. Varieties very numerous.

N. TAZETTA (Tazetta). Bulb $1\frac{1}{2}$ to 2 inches thick. Leaves somewhat flat and glaucous, bluntly keeled, four or six to a scape. Flowers four to eight from each scape, powerfully fragrant, a little over an inch across; perianth white, segments spreading; crown bright yellow, the edge slightly lobed or toothed; scape 1 foot high; March. Plate 260. Varieties numerous.

N. TRIANDRUS (three-stamened). Bulb not more than $\frac{1}{2}$ inch thick. Leaves rush-like, very slender, three or four to a scape. Flowers white, horizontal or drooping; tube very slender, cylindrical, perianth segments turned back over it; crown conical-bell-shaped; scape very slender, one- or two-flowered, 6 to 12 inches long; April. Several varieties.

Garden Varieties. Somewhere about a thousand named varieties are grown in gardens, and these are classified in three divisions, according to the character of the crown, thus—

Group I. MAGNICORONATI, offspring of *N. Pseudo-narcissus* or *N. Bulbocodium*, with crowns as long as the perianth divisions.

Group II. MEDIOCORONATI, resembling *N. triandrus*, with intermediate crowns.

Group III. PARVICORONATI, descendants of *N. Jonquilla*, *N. Tazetta*, and *N. poeticus*, with crowns not half as long as the perianth divisions.

NEW ZEALAND FLAX

(PHORMIUM TENAX)

1/6 Nat. size

PL. 267

I. Magnicoronati

Ard Righ, Yellow King; very large yellow trumpet with deep yellow perianth; early and robust.
Cernuus; white; habit graceful and distinct; early.
Emperor; clear pale yellow, large and robust.
Empress; perianth nearly white, crown deep yellow.
Grandis; pure white large perianth, trumpet full yellow; late.
Horsfieldii; similar to *Empress*, but blooming a fortnight earlier.
Obvallaris, "Whitby Daffodil"; medium size, distinct from all others; crown deeper yellow than perianth.
Telamonius plenus; the double form of the common yellow Daffodil.

II. Mediocoronati

Barri conspicuus; perianth segments broad, yellow paling towards tips; crown fringed, margined with orange-scarlet; fragrant.
Leedsi C. J. Backhouse; perianth golden yellow; crown orange-red.
Sir Watkin, "Great Welsh Daffodil"; perianth primrose; crown golden.

III. Parvicoronati

(*a*) Poeticus.

Poeticus ornatus; large and fine shape; perianth pure white, with broad segments; crown red; very fragrant.
Poeticus plenus, the "Gardenia-flowered Narcissus"; very double and fragrant; pure white; much finer than a *Gardenia*.
Poeticus recurvus; very similar to *ornatus*, but more robust, more prolific, and a fortnight later.

(*b*) Polyanthus

Bazelman major; perianth large, pure white; crown suffused with orange.
Gloriosus; perianth white; crown orange.
Grand Soleil d'Or; perianth rich yellow; crown deep orange.
Jaune Supreme; perianth yellow; crown orange.
Staten General; perianth white; crown yellow.
Scilly White; white; crown creamy.

Cultivation. The soils most suitable for Narcissus-culture are those that are light, well-drained, and not very rich. Those whose natural habitat is the warmer parts of Europe succeed best on poor gravelly soils with plenty of sunshine; others do well in partial shade. Ordinary manures should not be used, as they tend to disease and failure. This remark, indeed, applies to all bulbous plants. The only stimulants allowed should be wood-ashes, road-scrapings, and fresh meadow-loam mixed in equal proportions and applied as a top-dressing; or a small quantity of bone-dust may be mixed with the soil before planting, using about 1½ ounce to the square yard of land. Where there is a bank, as of an enclosing hedge, it should by utilised for *Narcissi*. In some districts it is quite a common thing to see these plants growing in great clumps on the hedge-banks, where they have escaped from gardens and orchards and gradually made their way to the summit. They may also be planted among grass in any position where their leaves will not be in danger from the lawn-mower, the retention of the foliage until it naturally withers being essential for the ripening of the bulb. When the

clumps have become too crowded they should be taken up in July, and the bulbs separated and replanted before they emit new roots. Imported bulbs should be planted as soon as purchased, and dibbling should not be resorted to; instead, a trench should be drawn of sufficient depth to allow at least 3 inches of soil above the top of the bulb. Many of the ordinary Narcissi and all the Polyanthus sorts may be grown well in pots, treating them much after the manner adopted for pot Hyacinths, plunging the pots in ashes outside and covering thickly with cocoanut-fibre, the object being to induce plentiful root-growth without stimulating the production of leaves. When the latter begin to appear the pots should be removed to a cool pit or greenhouse, and the flowers allowed to develop naturally; or, by submitting them to brisk bottom-heat, accompanied with liberal waterings, force them.

Most of the kinds seed freely, and the seeds may be sown as soon as ripe, in special beds of well-drained, light, sandy soil, where they need not be disturbed until they commence to flower. Some of the species bloom in their third year, some in their fourth, but as a rule the larger kinds do not flower until the fifth year. No seedling should be destroyed because its first flowers do not come up to expectation; it should be given a couple of years longer to show of what it is really capable. Propagation is also effected by separating the offshoots.

Description of Plates 259 and 260. Plate 259. A, *Narcissus Jonquilla*, the Jonquil; the natural size. Fig. 1, a section through the flower. B, *N. Pseudo-Narcissus*, the Daffodil, or Lent Lily, slightly reduced. Fig. 2, a section of the flower; 3, the bulb. The seed capsule is shown between the letter B and the figure 2.

Plate 260. Varieties of *N. Tazetta*, the Polyanthus Narcissus. A is the var. *dubius*; B, the type; C, a double form.

SCARBOROUGH LILY

Natural Order AMARYLLIDEÆ. Genus *Vallota*

VALLOTA (named in honour of Pierre Valot, a French botanist of the 17th century). A genus containing only one species, a beautiful bulbous plant, with long strap-shaped leaves, and umbels of large brilliant scarlet flowers, produced at the summit of a tall scape. The perianth is erect, funnel-shaped, 3 or 4 inches long, with six oblong-oval divisions; the tube short, with an enlarged throat. The six erect stamens are equal, the style simple, and the membranous spathe splits

PLANTAIN LILY

(FUNKIA OVATA)

Nat. size

PL. 268

into two or three divisions. The scape is stout and hollow, about 2 feet high. It flowers during summer and autumn. It is a native of South Africa, and was introduced in 1774 by Francis Masson, who was sent out to collect plants for Kew Gardens. There are several varieties. Var. *eximia* is a trifle larger, of the same colour as the type, but with a white throat which is feathered with crimson. The var. *magnifica* appears to differ from the last only in the point of size.

Culture. Generally speaking, *Vallota* must be grown as a greenhouse plant, although in the extreme South it is hardy in situations not too exposed. Here the bulbs should be planted deeply (6 or 8 inches), and surrounded with sand before covering with ordinary soil. They should be well and regularly watered during the period of growth, and should remain undisturbed until there is danger of crowding. In most gardens, however, they are grown in pots, under glass. The bulbs may be grown either singly in 4-inch pots, or in clusters of six or eight, in 10-inch pots, in a loamy soil. They should be only partially buried. Whilst growing they should be placed near the glass in a sunny position; and when growth is completed, rest may be induced by witholding water. If pot-bound, a condition conducive to floriferousness, manure water may be given now and then.

Description of Plate 261. *Vallota purpurea*, the Scarborough Lily. Flowers about one-third less than the natural size; bulb and leaves about two-thirds less than nature. Fig 1, a section of flower.

JACOBEAN LILIES

Natural Order AMARYLLIDEÆ. Genus *Sprekelia*

SPREKELIA (derived from the name of J. H. Sprekelsen, of Hamburg, who wrote on Liliaceæ, and died 1764). A genus consisting of a single species. It has a bulbous root, with narrow strap-shaped leaves, six or seven to a scape. The scape is hollow, somewhat two-edged, and appears with the leaves. The flower is at first enclosed in a spathe, afterwards bent downwards (*declinate*), and has scarcely any tube, the almost unequal segments free to the base, where they are broader than above. The stamens are attached to the segments at the base, and recurved like the style. A native of Mexico and Guatemala: introduced 1593.

SPREKELIA FORMOSISSIMA (most beautiful). Flowers large, showy, crimson, solitary or (rarely) twin; June. Height, 2 feet. Plate 262. There are several named varieties.

Cultivation. *Sprekelia* requires a warm, dry and well-drained position at the foot of a south or south-west wall, when grown outside. It may, in fact, be treated as recommended for *Vallota*, and the reader is therefore referred back to that genus for details. If grown in pots, it requires the same treatment as *Hippeastrum*, but a cool greenhouse temperature.

Description of Plate 262. *Sprekelia formosissima*, the Jacobean Lily, about one-half the actual dimensions. Fig. 1 is a section through the flower.

BELLADONNA LILY

Natural Order AMARYLLIDEÆ. Genus *Amaryllis*

AMARYLLIS (the name of a country-woman mentioned in Virgil's *Eclogues*). A genus of one species with a bulbous rootstock, and an autumnal flower scape supporting a many-flowered umbel of large, stalked, handsome flowers. The numerous strap-shaped leaves do not appear until spring. The flowers are funnel-shaped with a short tube, the six segments broad and ribbed, the tips somewhat spreading. Three of the stamens are attached to the base of the segments, and three to the mouth of the tube. The scape is tall, solid, and somewhat flattened. The name Amaryllis is still universally given in gardens to the species and hybrids of *Hippeastrum*, which has a flower like that of the present plant, but entirely different capsules and seeds.

Species. AMARYLLIS BELLADONNA (beautiful lady). Bulb large, as big as a swan's egg. Flowers three to twelve in an umbel, fragrant, variable in size and colour, ranging from almost white to a reddish purple, most frequently a delicate rose colour streaked with red; September. Height, 2 feet. Native of South Africa; introduced 1712. There are several named varieties.

Culture. Planted in a warm, dry position against a wall, the Belladonna Lily soon becomes thoroughly established and multiplies. We know cottage gardens in the South of England where it comes up freely, not merely in beds and borders, but pushing through hard gravelled paths also. In the neighbourhood of London it does not flower unless planted against the south wall of a heated building, such as a plant-stove. The bulbs should be planted in July, 6 inches deep in a loamy soil and close to the wall. It may be grown in pots along with *Vallota*.

FLAME FLOWER

(KNIPHOFIA ALOIDES)

$^{2}/_{3}$ Nat. size

PL. 269

IMANTOPHYLLUMS

Natural Order AMARYLLIDEÆ. Genus *Clivia*

CLIVIA (named in honour of a Duchess of Northumberland, a member of the Clive family). A genus of three species of evergreen bulbous plants, with strap-shaped leaves in two rows, from amid which arises the flattened scape, bearing an umbel of drooping flowers. The perianth is funnel-shaped and six-parted, the divisions nearly equal. The six stamens are equal and protrude slightly; the style bears a three-lobed stigma. The species are South African.

History. *Clivias* are better known in gardens as *Imantophyllums*, sometimes spelled without an *n*. The history of the genus is chiefly philological. *C. nobilis* was introduced from South Africa in 1828, and Sir W. J. Hooker founded the genus *Imatophyllum*, signifying plants with leaves like leather thongs. Sprengel corrected this into *Himantophyllum*, but finally this got further corrected by dropping the *H.* Lindley, however, called it *Clivea*, since corrected to *Clivia*, and Sir William Hooker proposed to restrict his genus to the species depicted in our Plate 263, which he called *Imantophyllum miniatum*. This, however, is now included among *Clivias*, and the specific name has been corrected by Regel to *miniata*. Recently many seedling forms of this species have been raised and named in gardens, but many of them are scarcely distinguishable from the type. This species was introduced from Natal in 1854, and *C. Gardeni* came from the same locality in 1862. *C. cyrtanthiflorum* is a garden hybrid between *C. miniata* and *C. nobilis*.

Species. CLIVIA CYRTANTHIFLORUM (Cyrtanthus-flowered). Flowers large, salmon-pink or pale flame-coloured, with white centre and greenish tips, cup-shaped, drooping; umbels many-flowered; winter and spring. Hybrid.

C. GARDENI (Garden's). Flowers reddish orange or yellow, 2 to 3 inches long; umbel ten- to fourteen-flowered; scape from 1 to 2 feet high; winter.

C. MINIATA (red). Flowers bright orange, yellowish at base; ten to twenty in an umbel; scape 1 to 2 feet high; spring and summer. Plate 263. The var. *splendens* has brighter, deeper-coloured flowers. There are many garden varieties, three of the finest being *grandiflora*, *Lindeni*, and *splendens*.

C. NOBILIS (noble). Flowers orange-scarlet, tipped with green; perianth curved, funnel-shaped; the outer divisions shorter than the inner; forty to fifty in an umbel; May. Height, 1 to 2 feet.

Cultivation. *Clivias* may be grown either in pots or in borders in a warm greenhouse. The best soil for them is a compost of fibrous loam and rotten cow-dung, in the proportion of three of the former to one of the latter. Whilst mixing up, add a little charcoal to keep it sweet, for the plants require a great deal of water during the growing period. A few bones crushed small and mixed in will also be an advantage, and there should be a good thickness of drainage material. They are not plants that require frequent repotting; fair-sized plants may therefore be put in large pots at once. They will scarcely require anything larger than 10 inches across. They grow during spring and summer, when they must have a temperature between 50° and 60°, with plenty of air. Water may be applied freely both to the root and by syringing the leaves; but in autumn, syringing must be stopped, and during winter only sufficient water should be given to prevent the soil getting quite dry. At this season, too, the plant must be kept cool, to induce rest. Instead of repotting, it will be found more advantageous to the plant to give it a top-dressing of rich soil in spring. When in bloom the plants should be removed to a cool, airy conservatory, which will prolong the blooming period.

Description of Plate 263. *Clivia miniata*, reduced about one-fourth below the natural size. Fig. 1 is a section of the flower showing attachment of the stamens, etc.

IXIOLIRIONS

Natural Order AMARYLLIDEÆ. Genus *Ixiolirion*

IXIOLIRION (from *Ixia* (see p. 256), and *leirion*, a lily). A genus of two species of bulbous plants with erect unbranched stems bearing leafy bracts, and near the top small clusters of flowers. The leaves are long, very slender, channeled, glaucous, sheathing at the base. The flowers are erect, six-parted, funnel-shaped, violet or blue, on long stalks; the divisions narrow lance-shaped. The six erect stamens are attached near the base of the tube, and the thread-like style ends in three slender channeled stigmas. They are natives of Asia Minor and Northern Asia.

GASTERIA VERRUCOSA

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Flowers Nat. size; Plant $^1/_2$ Nat. size

PL. 270

Species. IXIOLIRION KOLPAKOWSKIANUM (Kolpakowski's). Flowers blue or white, somewhat trumpet-shaped; summer. Height, 1 foot. Introduced from Lake Sairan, 1878.

I. MONTANUM (mountain). Flowers violet-blue, segments spreading irregularly; June. Height, 12 to 20 inches. Introduced from Syria, 1844. Plate 264. There are two or three varieties in cultivation, differing but slightly from the type.

Cultivation. *Ixiolirions* should be grown in good, light, well-drained soil, on a warm, sunny border. It is advisable in this climate to take up the bulbs in autumn and store them in dry sand in a cool, but frost-proof, place, and to give them the protection of a handlight after planting them in spring. Owing to the weakness and slenderness of the flowering-stems, these should be tied up to a stick as they grow, or the wind, or the weight of the flowers, will bring them to the ground.

Description of Plate 264. *Ixiolirion montanum*; leaves, stem, and flowers, natural size. Fig. 1, section of a flower.

TUBEROSE

Natural Order AMARYLLIDEÆ. Genus *Polianthes*

POLIANTHES (Greek, *polios*, white or bright, and *anthos*, a flower). A single-species genus, consisting of the well-known Tuberose, *Polianthes tuberosa*, which has an erect tuberous rootstock, from which arises a tall, roundish stem, 3 or 4 feet high, sparsely provided with long, slender, lance-shaped leaves. The upper part of the stem is rather zigzag, and bears numerous very fragrant creamy white flowers, borne in pairs from the axils of membranous bracts. These flowers have a very short footstalk, the perianth funnel-shaped, with a long, slender, curved tube, and six incurved, nearly equal, divisions. The six stamens are inserted in the tube. The Tuberose is a native of Mexico, but has been widely cultivated in the East for centuries; it was introduced to English gardens about the year 1629. There are several varieties: "African," "American," "Italian," etc. The best is "The Pearl," which is of dwarf habit, with pure white flowers.

Cultivation. It is the prevailing custom to grow Tuberoses only from newly imported bulbs; these are so greatly impoverished by the abundant flowers that they have little chance of recuperating in this country sufficiently to make them worth growing a

second year. Bulbs of the African varieties arrive here in September or October; the American and Pearl, in December. Some should be potted as soon as they can be obtained from the dealers: and if a succession is desired, others can be kept for months in a perfectly dry place, where the temperature will not fall below 50°, and a few potted at intervals up to June. By this means it is possible to have Tuberose flowers for decorative purposes nearly all the year round. They should be potted singly in 4-inch pots, or five in an 8-inch pot, in a compost of rich loam, two parts, and leaf-mould, one part, and placed in a warm greenhouse or frame. If space is limited, they may be put under the stage until they come into growth. As soon as the shoots appear the pots should be placed near the glass and kept there, for, being naturally inclined to grow tall, everything possible should be done to keep them dwarf. When they commence to flower they may be removed to a conservatory or other cool house, if in summer; or may even be placed out in a sunny border. Good flowers may be grown in a sheltered border in the open air in warm localities, if the tubers are planted in sandy soil in May. Readers will pardon us for reminding them that Tuberose is a word of three syllables—Tu-ber-ose; we frequently hear it pronounced Tube-rose.

Description of Plate 265. *Polianthes tuberosa*, the Tuberose, showing bulb, stem, and flowers. Fig. 1 is a section through a detached flower.

KNIGHT'S STAR LILIES

Natural Order AMARYLLIDEÆ. Genus *Hippeastrum*

HIPPEASTRUM (Greek, *hippeus*, a knight, and *astron*, a star). A genus of about forty species (including *Habranthus* and *Phycella*) of bulbous plants with showy flowers, usually cultivated under the name of Amaryllis. These are of striking colours, large, funnel-shaped, and borne in a small umbel at the top of a hollow scape. The perianth is six-parted, the divisions irregular, for the upper one of the outer series is broader than the others, and the lower one of the inner series narrower. The stamens are unequally inserted in the tube, and the style is three-lobed. The species are natives of the hotter portions of South America. Most of those in cultivation are hybrids, which are produced freely in this genus. The flower-scapes are usually produced a little earlier than the leaves.

TREE ALOE

(ALOE ARBORESCENS)

Flowers Nat. size; plant greatly reduced

PL. 271

Principal Species.

HIPPEASTRUM AULICUM (courtly). Leaves broad, strap-shaped, closely striated. Flowers large, rich crimson, green at base, and above the green a dark red-purple blotch. Scape about 1½ foot high. Introduced from Rio de Janeiro, 1810. Stove.

H. EQUESTRE (knightly). The Barbados Lily. Flowers bright red, with a yellowish green star. The species is a native of Tropical America and the West Indies. It is also cultivated or naturalised in the Tropics of the Old World. Introduced 1710. Stove.

H. LEOPOLDI (Leopold's). Flowers regular, 7 inches across, with broad segments coloured red and white, on stout stalks. Introduced from Peru in 1869. One of the largest and most vigorous, and also one of the principal, progenitors of the garden race of *Hippeastrums*. Greenhouse.

H. PARDINUM (leopard-like). Flowers 6 inches across, cream-coloured, thickly spotted with crimson. Greenhouse. Introduced from Peru, 1866.

H. PSITTACINUM (parrot-like). Flowers 5 inches across, red, with crimson streaks and a conspicuous greenish star; on scapes 3 feet high. Greenhouse. Brazil, 1814.

H. RETICULATUM (netted). Flowers 4 inches across, mauve-red, barred with crimson; on scapes a foot high. Var. *striatifolia* has leaves with a white central band. Stove. Introduced from Brazil in 1777.

H. VITTATA (striped). Flowers white, each division with two red stripes. Greenhouse. Introduced from South America, 1819.

Cultivation.

Hippeastrums are not difficult plants to grow if they get the special conditions they require, and they give a splendid return in a grand show of striking flowers. The bulbs should be potted about February, in strong loamy soil, mixed with charcoal and crushed bones, on a layer of good drainage, in 5- to 7-inch pots, and placed in a sunny position in a warm, moist house. Growth will begin almost immediately, and with it the flower scapes; and if plenty of air and light are given during the summer, fine leafy plants will result. Whilst in flower they should be shaded from bright sunshine, in order to preserve the blossoms. From September to February they should be kept cool and given little water, to allow a period of rest. If a top-dressing be given when growth begins each year, and occasional manure-water during the growing period, established plants will not require repotting. Some growers, however, prefer to repot the bulbs annually. When large numbers are grown they are best accommodated in a bed of spent tan, in which the pots are buried

below the rim, so that the roots can grow into the tan. There are now many named seedling varieties and hybrids which are cultivated in preference to the species. They are propagated from seed for new varieties and hybrids, and by means of offsets from the bulbs.

SOME OTHER AMARYLLIDS

Natural Order AMARYLLIDEÆ

THERE are a number of genera of this order, too important horticulturally to be ignored, but which the plan of the work and exigencies of space will not allow us to treat at length. Among these are the genera—

NERINE (the name of a water-nymph). A genus of about ten species of South African bulbous plants, with strap-shaped leaves and umbels of flowers, with the perianth divided into slender segments. The best-known species is *Nerine sarniense*, the Guernsey Lily, which was introduced in a singular manner. About the year 1680 a vessel was wrecked in the Channel, and among the wreckage washed ashore were a large number of bulbs of this plant. Many of them rooted and grew, naturalising themselves—though no longer to be found there. It has pale salmon-coloured flowers, which appear in autumn. *N. curvifolia* (introduced 1788) has bright scarlet flowers, which appear in autumn. The potting mixture should be good loam and leaf-mould, with the addition of charcoal and sand. They require bottom-heat, though of a mild character, with plenty of moisture after growth has well started; after completing their growth, which they make between October and May (they grow all through the winter), they should be allowed to rest, and when the leaves have died, the bulbs should be kept perfectly dry and cool until the flower-spikes appear, when they should be watered. There are many garden hybrids and seedlings.

GALANTHUS (Greek, *gala*, milk, *anthos*, flower: milk-white flowers). A genus of three species of hardy bulbous plants, well known as Snowdrops, of which our native *Galanthus nivalis* is the type. There are only two leaves, and the flowers are solitary, hanging from the spathe at summit of the scape. The three inner segments of the perianth are much shorter than the outer three, and are marked with green. *G. Elwesii*, introduced from Asia Minor, 1875, has larger flowers, but is otherwise similar. The third species is *G. plicatus*, introduced from the Crimea, 1818: it is of larger growth than *G. nivalis*,

SILK GRASS

(YUCCA FILAMENTOSA)

Nat. size

PL. 272

but the flowers often smaller and of a more greenish hue. The bulbs of all should be planted permanently where they can remain undisturbed. Any garden soil will suit them. In summer they may have a top-dressing, and the surface may be sown with annuals without interfering with the bulbs.

LEUCOIUM (Greek, *leukos*, white, and *ion*, a violet). This genus, which contains nine species, two of which are native, is distinguished from the last by the leaves being more numerous, the flowers from one to six to a scape, and the perianth divisions all but equal in length. The best-known species are the two that are found locally in Britain. *Leucoium æstivum*, the Summer Snowflake, with white flowers, each segment tipped with green; from four to eight to a scape; May and June. Height, about 18 inches. *L. vernum*, the Spring Snowflake, is much smaller, not more than 6 inches high, with solitary or twin flowers, fragrant, appearing in February and March. They succeed best under the treatment suggested for *Galanthus*—to be planted and left alone.

EUCHARIS (Greek, *eu*, well, and *charis*, grace: very graceful). A genus of five or six species of South American stove bulbous plants, all in cultivation, and producing broad oval or elliptic evergreen leaves on long stalks, and tall scapes bearing clusters of nodding, fragrant, white flowers, which are tubular, slender, with six broad, spreading segments, and within these a cup-shaped corona bearing the six stamens on its edges. *Eucharis candida* (introduced 1851) has a bulb as large as a hen's egg, bearing a solitary leaf, and a six- to ten-flowered umbel on a 2-feet scape; the flowers 3 inches across. *E. grandiflora* (*amazonica*) (introduced 1854) has flowers 4 to 5 inches across, the corona tinged with green, in three- to six-flowered umbels. There are several leaves. *E. sanderiana* (introduced 1882) is similar to the last, but smaller—about 3 inches across—and the corona is suppressed; the inside of the tube and the filaments of the stamens are yellow. The bulbs should be planted in large pots, and deeply, putting half a dozen bulbs into a 10-inch pot. The compost should be rich loam, two parts, to one part of mixed leaf-mould and manure, to which a little charcoal should be added. They require a minimum temperature of about 65°, increased to about 80° in summer. So long as they are growing they require plenty of water, and when the flower-buds appear, liquid-manure as well. Removal to a cooler house at this period ensures a longer duration for the flowers. They are propagated by means of the offsets produced around the bulbs. There are several good hybrids of garden origin.

PANCRATIUM (Greek, *pan*, all, and *kratys*, powerful: supposed to be

a potent medicine). A genus containing about a dozen species of bulbous plants, with strap-shaped leaves, and umbellate white flowers on tall scapes. The flowers are tubular, with a funnel-shaped perianth of six narrow lobes and a cup or false corona, which is sometimes produced into two teeth or lobes. The principal species are those named below. *Pancratium illyricum* (introduced from South Europe, 1615) has broad, strongly-veined, strap-like leaves, and fragrant flowers, with somewhat short tube; scapes about 1½ foot high. *P. maritimum* (introduced from South Europe, 1759) is taller (2 feet), with narrower persistent leaves, and very fragrant flowers, with exceedingly long tubes, in large umbels. Both flower in June, and in the West of England both may be grown out of doors, but in other districts *P. maritimum* requires the protection of a frame or cool greenhouse. For pot-culture they should be grown in a compost consisting of turfy loam, two parts, peat, one part, and leaf-mould, one part, with the addition of a little silver sand. They require plenty of water when growing, and a little even when at rest. Outdoor specimens should be planted deeply, and the surface covered with protective material in winter.

ASPIDISTRAS

Natural Order LILIACEÆ. Genus *Aspidistra*

ASPIDISTRA (Greek, *aspidision*, a little shield; the form of the flower). A small genus of smooth evergreen herbs, with creeping stems, oblong, lance-shaped leaves, and solitary, stalkless, dull purple flowers. The perianth is bell-shaped, cleft into six or eight lobes; the stamens are six or eight, inserted in the broad perianth-tube. There is a small cylindrical ovary, surmounted by a short, thick style, terminated by a large umbrella-like rayed stigma, which almost entirely fills the mouth of the perianth. The species are natives of China and Japan.

Principal Species.

ASPIDISTRA ELATIOR (taller). Leaves large, oblong, leathery, 1½ to 2 feet high. Introduced from Japan, 1835.

A. LURIDA (lurid). Leaves leathery, oblong, lance-shaped, 1 to 1½ foot high. Flowers purple and yellow. Introduced from China, 1822. Plate 266. The var. *variegata* has leaves with alternating stripes of white and green. It is much grown as a pot foliage-plant.

Cultivation.

A. LURIDA is very nearly hardy, but it is best used as a pot-plant for conservatory, window, and table decoration. It bears the dust and dry heat of dwelling-rooms better than most

CORDYLINE TERMINALIS

Reduced

PL. 273

plants, and with occasional spongings the leaves keep wonderfully well. The best soil for potting is a compost of rich loam and leaf-mould in equal portions, with a little sand added. The variegated form should be potted in poor soil, or it soon becomes green. The drainage should be efficient, as they require a good deal of moisture during the summer. When repotting is necessary, it should be carried out early in the year, before the new growth begins. Care should be taken not to damage the rootstock; and it is well to keep the plant for a short time under a closed frame, to enable it to get well established. Propagation is effected by division.

Description of Plate 266. *Aspidistra lurida*, one-fourth less than the natural size, with leaves and flowers. Fig. 1 is a section through the singular flower, showing the parts.

NEW ZEALAND FLAX

Natural Order Liliaceæ. Genus *Phormium*

Phormium (Greek, *phormos*, a basket or plaited mat; from the use to which the leaves and fibres are put). A genus of two species of fleshy-rooted perennials, with rigid sword-shaped leaves in opposite rows, clasping each other at the base. From the centre of the tuft rises a tall, slightly zigzag flower-stem, with alternate short flower-spikes from the axils of large bracts. The flowers are tubular, with a perianth of six erect divisions, the three inner with spreading tips. The six stamens project beyond the mouth of the flower. There is a three-celled ovary, a three-sided style ending in a simple stigma: and the fruit is a three-sided, three-valved capsule, with two rows of flattened black seeds in each cell. They are natives of New Zealand.

History. Captain Cook, on his first visit to the New Zealanders, found the fibres of *Phormium tenax* in general use for the manufacture of many useful articles, including clothing, baskets, fishing-nets, mats, etc. It was not until 1789 that living specimens reached this country, and from that date many attempts have been made to grow it here for commercial purposes, but without success, most of our winters being too severe for it. In many places in the South of England it is quite hardy in gardens; but this, of course, is a very different matter from growing it in open fields, as would be necessary for commerce. Great quantities of the leaves and fibres are imported annually for the purpose of manufacturing ropes and twine. The

leaves are cut when they have attained their full growth, and soaked in water for several days, to macerate the softer tissues and separate the fibres. The roots are used as a substitute for sarsaparilla. *P. cookianum* was introduced in 1868.

Species. PHORMIUM COOKIANUM (Cook's). Small Flax Lily. Leaves 2 to 3 feet long, rarely split at tip. Flower-scapes 3 to 6 feet high; flowers yellow, sometimes with outer segments greenish, little more than an inch long; summer. The var. *variegatum* has the leaves decorated with one or two marginal stripes of creamy white.

P. TENAX (tough). Leaves very tough, 3 to 6 feet or more long, usually split at the tip; dark green with reddish brown margin. Flowers variable, red and yellow, 2 inches long; flower-scapes as high as 16 feet; August. Entire plant larger and hardier than the foregoing species. Plate 267. There are several varieties: Var. *atro-purpureum* has reddish purple leaves; var. *nigro-pictum* is smaller, with very dark purple margin, becoming broader towards base; var. *variegatum* is similar to the corresponding var. of *P. cookianum*.

Cultivation. These plants succeed best in a rich loamy soil. In the extreme South of England they are quite hardy in an ordinary garden. In other places it is well to grow them in tubs, which can be kept in the cool greenhouse or conservatory in winter, and placed outside in summer. They may be grown from seeds, or, when the clumps are large enough, the roots may be divided early in the year, before growth commences, and kept in the greenhouse until established.

Description of Plate 267. *Phormium tenax*, the Common New Zealand Flax, reduced to about one-sixth of the natural size. The flowers are not shown.

PLANTAIN LILIES

Natural Order LILIACEÆ. Genus *Funkia*

FUNKIA (named in honour of H. Funck, a German botanist, 1771–1839). A genus of about five species of Japanese herbs with tuberous roots, broad oval or heart-shaped leaves, and a tall flowering stem, usually leafless, but furnished with bracts, in the axils of which the flowers are produced solitarily, the whole cluster constituting a raceme. These flowers have a tubular, six-parted perianth: the six stamens and the

AFRICAN LILY

(AGAPANTHUS UMBELLATUS)

Nat. size

PL 274

style bent at their extremities. The black membranous coat of the seeds is produced into a wing at the top.

Principal Species.

FUNKIA FORTUNEI (Fortune's). Leaves narrow, heart-shaped, glaucous, six or eight to each stem. Flower-stem 1½ foot high; flowers pale lilac, 1½ inch long; July. Introduced from Japan, 1876.

F. LANCIFOLIA (lance-shaped leaves). Leaves lance-shaped. Flower-stem 8 or 9 inches high, raceme six- to ten-flowered, scarcely above the leaves. Flowers white or tinged lilac, 1 inch or 1½ inch long; August. Introduced from Japan, 1829. There are several varieties: *albo-marginata* has slightly larger flowers and leaves, the latter marked with white near the edge; var. *undulata* has the leaves irregularly crisped and frilled, as well as marked with patches and streaks of white; the var. *variegata* also has the leaves variegated with white.

F. OVATA (oval). Leaves oval, in some varieties marked with white. Flower-stem 12 to 18 inches long (twice length of leaves), with a ten- to fifteen-flowered raceme. Flowers bluish lilac, violet-blue, or white, 1½ to 2 inches long; May. Native of Japan and Northern China, introduced 1790. Plate 268. The var. *marginata* has the leaves broadly bordered with white.

F. SIEBOLDIANA (Siebold's). Leaves heart-shaped, glaucous. Flower-stem no taller than leaves, ten- to fifteen-flowered. Flowers white, delicately tinged with lilac, 2 to 2½ inches long; June. Introduced from Japan, 1836.

F. SUBCORDATA (somewhat heart-shaped). Leaves oval, heart-shaped, pale. Flower-stem 1½ to 2 feet high, nine- to fifteen-flowered. Flowers fragrant, pure white, over 4 inches long; August. Introduced from Japan, 1830. Also known as *F. grandiflora*.

Cultivation.

Funkias succeed best in a deep, rich soil, the result of deeply digging in thoroughly rotted manure. The situation should be rather shady than otherwise, and a good lookout should be kept for snails and slugs, which are very partial to the leaves, and therefore very destructive. They make admirable subjects to grow in pots for the greenhouse and conservatory; and for this purpose they should be potted in a compost of rich loam, two parts, leaf-mould, one part, with a little sand added. Propagation is effected by dividing the crowns in spring.

Description of Plate 268.

Funkia ovata, the Plantain Lily. Flowers about natural size, but plant greatly reduced. The separate figure is a section of the flower.

FLAME FLOWERS

Natural Order Liliaceæ. Genus *Kniphofia*

Kniphofia (named in honour of Prof. J. H. Kniphof, of Erfurt, 1704–1763). A genus of about eighteen species of tufted hardy perennial herbs, better known in gardens under the synonym of Tritoma. They have long, slender, grass-like radical leaves in a tuft, from the centre of which a tall scape arises bearing an oval spike of drooping tubular or bell-shaped flowers. The perianth is six-parted, and from its mouth protrude the six stamens and the thread-like style. The three-celled capsule opens by three valves. They are all natives of Africa and Madagascar.

History. *Kniphofia aloides*, the best known species, was introduced from the Cape of Good Hope in 1707. It is often called in gardens by the name of Red-hot Poker, as well as Flame Flower. *K. pumila* was introduced in 1774, *K. Burchelli* in 1816, *K. Rooperi* in 1854, *K. præcox* and *K. caulescens* in 1862, *K. Macowani* in 1874; all from South Africa. In 1879 both *K. carnosa* and *K. comosa* came from Abyssinia, and from the same country, a year later, *K. Leichtlinii*. In the year 1887 *K. Kirkii* was introduced from South-Eastern Tropical Africa, and *K. pallidiflora* from the Ankaratra Mountains of Madagascar. During the last twenty years gardeners have raised numerous hybrids and seedling varieties, many of which are superior to the species.

Principal Species. Kniphofia aloides (Aloe-like). Flame Flower. Leaves long and slender, keeled and channeled, edges and keel finely toothed. Flowers on tall scapes 3 to 4 feet high; coral-red, paling as they fade; August and September. Plate 269. There are several varieties.

K. Burchelli (Burchell's). Leaves light green. Flowers scarlet and yellow, tipped with green; August and September. Scape spotted with black, 1½ foot high.

K. Leichtlinii (Leichtlin's). Leaves three-sided, ¾ of an inch thick and 4 feet long, spreading in all directions. Flowers dull pale vermilion and yellow; August.

K. Macowani (McOwan's). Leaves almost erect, nearly awl-shaped, channeled, and keeled. Flowers bright orange; scapes 1 to 1½ foot long: August.

K. Rooperi (Rooper's). Leaves broad, sword-shaped, strongly

TRIPLET LILY

(BRODIÆA (TRITELEIA) UNIFLORA)

Nat. size

PL. 275

keeled, edges finely toothed. Flowers orange-red, turning yellow; scape 1 foot high; November.

Cultivation. In the South of England *Kniphofias* are quite hardy in well-drained soils, but farther north they require some protection in winter, which may be given in the shape of dry fern or dead leaves. They succeed best in a light sandy soil, and must have plenty of water whilst growing. They are also much benefited by top-dressings of well-rotted manure. They may be propagated by separating (in autumn) the offsets that form round the old root. Seed may be sown in pans during April and May, germinated in a frame, and kept under glass for the first year.

Description of Plate 269. *Kniphofia aloides*, or Flame Flower. Upper portions of leaves and scape of the natural size. Fig. 1, a detached flower; 2, a section of the same.

GASTERIAS

Natural Order LILIACEÆ. Genus *Gasteria*

GASTERIA (Greek, *gaster*, the belly, suggested by the swollen base of the flowers). A genus of about fifty succulent-leaved greenhouse perennials, closely allied to the Aloes. The thick fleshy leaves are tongue-shaped, usually in two rows or rosette-like, covered with spots or warts, and clasping each other at the base. The flowers are red tipped with green, of long, curved, tubular form, with swollen base and six-parted mouth, in a raceme 1 to 3 feet long, supported on a slender bracted scape, about a foot long. The six stamens are attached to the base of the tube, and the capsule is somewhat ribbed. They are all natives of the Cape of Good Hope.

History. The first living *Gasterias* introduced to Britain date from 1731, when *G. angustifolia*, *G. carinata*, and *G. verrucosa* came hither. These were followed in 1759 by two other species, *G. maculata* and *G. pulchra*, and in 1796 by *G. glabra*. *G. brevifolia* appeared about 1809, *G. acinacifolia* in 1819, *G. disticha* in 1820, and *G. variolosa* in 1860. Many others have been introduced, but the most important species have been mentioned above.

Principal Species. GASTERIA BREVIFOLIA (short-leaved). Leaves ten or twelve, 3 to 4 inches long, dirty green plentifully spotted with white. Flowers red, an inch long; July. Height, 2 feet.

G. CARINATA (keeled). Leaves fifteen to twenty, crowded, lance-

shaped, concave, with distinct keel at back. Flowers red, 1 inch long; June and July. Height, 2 feet.

G. DISTICHA (two-rowed). Leaves ten to twelve, in two rows, crowded, spreading; face flat; covered with indistinct green spots. Flowers scarlet, nearly 1 inch long; July and August. Height, 2 feet.

G. MACULATA (spotted). Leaves sixteen to twenty, in two rows, more loosely disposed, somewhat spreading, bright shining green or purple with rosy base, and a profusion of white spots. Flowers scarlet, ¾ inch long; July and August.

G. PULCHRA (fair). Leaves sixteen to twenty, loosely disposed in two rows, but all with an upward direction; concave; spotted with bright green or purple. Height, 2 feet.

G. VERRUCOSA (warty). Leaves concave, ten to twelve, in two rows, outer ones spreading, point sharp, back swollen; covered with raised whitish spots. Flowers red, 1 inch long; March to November. Height, 1 foot.

Cultivation. *Gasterias* require greenhouse treatment, and should be firmly potted in a compost of sandy loam and peat, to which has been added some old brick and mortar rubbish and sand. There should be good drainage, to ensure the rapid passage of all superfluous water—which should always be given with care. In winter, water should only be given in sufficient quantity to prevent the leaves withering. They should be given a position in the greenhouse, where they will get plenty of light; but they cannot endure bright sunshine, which blisters the leaves. Otherwise, they will be found to require very little attention.

Description of Plate 270. *Gasteria verrucosa.* The figure of entire plant is reduced to one-half the natural dimensions, but the separate flower-scape represents the natural size. Fig. 1 is a detached flower, much enlarged; and fig. 2 is a section of the same. It is propagated by offshots from the old plants, and by seeds sown in light sandy soil about February or March, and germinated in heat.

ALOES

Natural Order LILIACEÆ. Genus *Aloe*

ALOE (said to be derived from *Alloeh*, the Arabic name for some of the species). A genus of about one hundred species of shrubs or (rarely) trees, with thick fleshy leaves, often arranged in rosette-fashion, and

(*A*) GRAPE HYACINTH (*Muscari comosum*)

(*B*) M. COMOSUM, *var. monstrosum*

(*C*) ,, ,, ,, *plumosa*

Nat. size

PL. 276

flowers in a raceme supported on a tall scape furnished with bracts. The perianth-tube is straight or slightly curved back, the six segments long and slender, stamens about same length as perianth. The fruit is membranous, three-celled, and contains many seeds. The species are mostly natives of Africa, and chiefly from the Cape of Good Hope.

History. *Aloe vera* has been in cultivation here for at least three hundred years. It is said to have been introduced from the Levant under the name of *A. vulgaris*, but its home is in South Africa, though it is widely grown throughout the Mediterranean Region and in the East and West Indies. Many an *Aloe* that is to be seen growing in cottage windows and other humble places has been brought home by sailors returning from the West Indies, who have discovered that it is easily transported if the juices of the plant are prevented from evaporating. So they tar the cut end, and tie the stump securely in a piece of tarred canvas, then hang the plant in the air. In this condition it will live for several years. Among the earliest species of *Aloe* to be introduced was *A. humilis*, from the Cape of Good Hope in 1620. A hundred years later came *A. variegata*, whose creamy-margined leaves are familiar as a window plant, and in 1727 *A. saponaria*; both from the Cape. *A. soccotrina*, which is said to supply the finest quality of the druggists' Aloes (which is the dried juice), came from the Cape in 1731. In the same year *A. arborescens* and *A. glauca* were introduced from the Cape, and since that date many others have been brought from the same country. In 1768 there were nine species growing at Kew, and by 1814 the collection had been increased to twenty-nine species. At the present time ninety species are represented there. Many species of *Aloe* and allied genera were introduced by James Bowie, who was sent out to the Cape in 1818 to collect for Kew Gardens, and remained there five years. The material sent home was dealt with by Haworth, who has described the species. The group has been more recently dealt with by Mr. J. G. Baker, of Kew, in the *Journal of the Linnean Society*.

Principal Species. ALOE ARBORESCENS (tree-like). Stem unbranched, 10 or 12 feet high. Leaves forming a dense rosette, 3 or 4 feet across; somewhat glaucous, channeled above, nearly 2 feet long, with horny prickles along the margins. Flowers red, in dense racemes a foot long. Plate 271.

A. HUMILIS (lowly). Stemless. Leaves 3 or 4 inches long, thirty or forty in a dense rosette: slightly concave, glaucous, with a few tubercles and faint lines; marginal prickles of paler colour. Flowers brilliant red, 1½ inch long; in loose racemes 6 inches long.

A. NOBILIS (noble). Stem 3 to 4 feet high. Leaves 10 or 12

inches long, concave, margins and underside prickly. Flowers red, about 1½ inch long, in dense raceme 6 inches long. Introduced from the Cape, 1800.

A. STRIATULA (striped). Stem 3 feet high, twiggy. Leaves slender, spreading, 6 to 12 inches long, slightly channeled, marginal prickles broadly triangular. Flowers yellow, 1 to 1¼ inch long, in rather dense raceme 3 to 6 inches long. Introduced from the Cape, 1821.

A. SOCCOTRINA (Socotrine). Stem often forked, 3 to 5 feet high. Leaves, thirty to forty in a dense rosette; slightly channeled, somewhat glaucous, sometimes spotted, 1½ to 2 feet long; marginal prickles pale and small. Flowers reddish, 1¼ inch long, in dense raceme 1 foot long.

A. TRICOLOR (three-coloured). Stem short. Leaves twelve to sixteen in a close rosette; lance-shaped, somewhat swollen on upper side, lower surface rounded, spots numerous, marginal prickles crowded and spreading. Flowers fleshy, coral-red, in a loose raceme; scape purple. Introduced from South Africa, 1875.

A. VARIEGATA (variegated). Leaves lance-shaped, 4 or 5 inches long, face concave, back keeled, spotted with grey on both sides, margin creamy white, with small teeth. Flowers reddish, 1¼ inch long, in loose raceme 3 or 4 inches long.

A. VERA (true). Stem about 2 feet high. Leaves sword-shaped, dense, channeled above, marginal prickles triangular, horny. Flowers yellow, in a dense raceme 6 to 12 inches long.

Cultivation. The cultural directions given under the head of *Gasteria* apply equally to *Aloes* and other succulents of allied genera.

Description of Plate 271. *Aloe arborescens*, the Tree Aloe. The raceme and flowers are shown of the natural dimensions, but the plant itself has been reduced to one-quarter of the real size, and the stem has been omitted altogether, in order to give as large a figure of the leaves as possible. Fig. 1 is a section through a somewhat enlarged flower.

YUCCAS

Natural Order LILIACEÆ. Genus *Yucca*

YUCCA (the native Peruvian name). A genus of about twenty species of woody-stemmed plants, with narrow lance-shaped leaves clustered at the summit of the trunk, which is sometimes dwarf, sometimes tall, branched and tree-like. These leaves are long, usually thick and rigid, ending in

GARDEN HYACINTH

(HYACINTHUS ORIENTALIS)

$^{2}/_{3}$ Nat. size

PL. 277

a spine, the margins devoid of distinct teeth, but frequently furnished with fine filaments, long and distant. The flowers are rather large and pendulous, in large many-flowered panicles. The six perianth-segments are distinct, or slightly connected at their base, more or less oval in shape, and rather thick in substance. There are six stamens with thick filaments, ranged round the fleshy ovary, which develops into the large, fleshy, spongy, or dry three-valved fruit. They are natives of the Southern United States, Mexico, and Central America.

History. *Yuccas* are variously known as Adam's Needle, Spanish Bayonet, Bear's Grass, and some of the species have their own distinctive popular names, as the one we have figured (Plate 272), *Yucca filamentosa*, which is popularly the Silk Grass. *Yucca gloriosa*, the Mound Lily, was in cultivation here earlier than the year 1596, having been brought from North America. *Y. filamentosa* was introduced from Virginia in 1675, and *Y. aloifolia*, whose home extends from North Carolina to the West Indies, was introduced in 1696. The slender-leaved *Y. angustifolia* came from Missouri in 1811; *Y. glauca* from North America, 1814; *Y. treculeana* from Mexico, 1858; and *Y. gigantea* from the same neighbourhood in the following year. A number of others have been introduced, but the above selection comprises the best of those generally grown. There are a number of varieties of each.

Principal Species. YUCCA ALOIFOLIA (Aloe-leaved). Stem usually unbranched in this country, 15 to 20 feet high. Leaves sword-shaped, 12 to 18 inches long, over an inch broad, slightly glaucous, ending in a reddish horny tip, the margins rough and whitish. Flowers white, 1½ to 2 inches long, in a dense panicle 1 to 2 feet long; May and June. Requires greenhouse protection. The variegated form is a handsome plant.

Y. ANGUSTIFOLIA (slender-leaved). Stem stout, short. Leaves very slender, rigid, 1½ to 2 feet long, and about ¼ inch broad; channeled, sharp-pointed; margins pale reddish brown, furnished with many filaments. Flowers greenish, 2 to 2½ inches long, in a terminal panicle 3 or 4 feet long; July. Hardy.

Y. FILAMENTOSA (thready). Silk Grass; Adam's Needle-and-Thread. Stemless, or nearly so. Leaves sword-shaped, Reed-like, slightly glaucous, 1½ to 2 feet long, 2 inches broad; margins whitish, clothed with long silky filaments. Flowers white, with a greenish tinge, 1½ to 2 inches long, in a panicle with zigzag branches 6 inches long; June. Hardy. Plate 272. The variegated form is usually grown in greenhouses.

Y. FLEXILIS (flexible). Stem short, unbranched. Leaves very slender, 2½ feet long, slightly plaited, with sharp point and brown horny

margins. Flowers white, 3 inches long, in dense panicle; June and July.

Y. GLAUCA (glaucous). Stemless. Leaves sword-shaped, about 18 inches long, with very narrow brown margins, sometimes sparingly furnished with filaments. Flowers white, 1½ inch long; panicles 2 to 3 feet long; June and July. Half-hardy.

Y. GLORIOSA (glorious). Mound Lily. Stem 4 to 6 feet high in old specimens. Leaves rigid and erect, 2 to 3 feet long, 2 to 3 inches broad, sharp-pointed, somewhat concave; margins red brown. Flowers tinged with red, about 2 inches long, in dense panicles 4 to 6 feet long; July. Hardy.

Y. RECURVIFOLIA (recurved-leaved). The best and commonest of all the hardy species. Stems ultimately 6 feet; leaves 2 to 3 feet long, 2 to 3 inches wide, dark green, erect when young, gracefully recurved when old. Scape erect, branched, 3 to 4 feet high, clothed sheaf-like with yellowish white flowers. Southern United States. Also known as *Y. pendula.*

Y. TRECULEANA (Trecul's). Stem 20 to 25 feet high, a foot or two in diameter, much branched. Leaves sword-shaped, leathery, rough, deeply concave; 2 to 4½ feet long, 2 to 3½ inches broad. Flowers white, 1½ to 2½ inches long; bracts white; in dense panicles, 2 to 4 feet long; June and July. Greenhouse.

Cultivation. *Yuccas* are in no sense difficult subjects, provided they are planted in rich light soil. Where such a description will not apply to the natural garden soil, a pit must be dug and filled up with suitable material, in which the *Yucca*, if a hardy species, may be planted. If a greenhouse species, it should be planted in a tub, which can be turned outside in summer and sunk in the ground. *Yuccas* require a considerable space to show them off properly. They look well at the far end of a lawn, or in a shrubbery border with a sunny position. They are propagated by means of suckers that sometimes shoot up from the roots, and these require merely separating after they have thrown out independent fibrous roots, and planting outside. Where these do not appear, cuttings may be made of the side shoots, and these, inserted in sandy soil, in gentle heat, will soon root. In some cases the stemless species may be divided without seriously marring the effectiveness of the tuft.

Description of Plate 272. YUCCA FILAMENTOSA, the Silk Grass. The Plate shows only a single leaf, a branch from the panicle, both natural size; and fig. 1, a detached flower cut through to show the organs.

SIBERIAN SQUILL

(SCILLA SIBIRICA)

Nat. size

PL. 278

COLOURED DRACÆNAS

Natural Order Liliaceæ. Genus *Cordyline*

Cordyline (Greek, *kordyle*, a club: in allusion to the large fleshy roots of some species). A genus of about twenty species of stove or greenhouse plants, usually with erect and unbranched stems, bearing heads of long, slender, more or less drooping leaves, and branched panicles of small white flowers. The perianth is tubular, bell-shaped, with six slender segments in two series. The six stamens are inserted in the mouth of the tube. Ovary, three-celled, with a thread-like style, ending in a three-lobed stigma. The fruit is three-celled, each cell containing from eight to fourteen seeds. They are natives of Tropical Africa, Asia, Australia, Madagascar, the Malay Archipelago, etc.

History. The species of this genus are much confused with those of *Dracæna*; in gardens they are all known as *Dracænas*, and in truth the differences between the genera are not nearly so striking as the general resemblance, and such as are not likely to make a deep impression upon horticulturists, however important the botanist may consider them. In *Dracæna* the cells of the fruit contain only one seed each. *C. terminalis* was introduced from the East Indies in 1820. It is a native of the South Sea Islands, but is cultivated almost everywhere in tropical countries, and in our own land has given origin to nearly all the plants which we grow in our stove under the name of *Dracænas*. *C. cannæfolia* came from Queensland, also in 1820. *C. australis* was introduced from New Zealand in 1823, and within a year or two of that date *C. indivisa* came from the same islands. These are the principal of the cultivated species; most of the others grown being mere garden varieties, originating as colour sports.

Principal Species. Cordyline australis (Southern). Stem stout, branching, 10 to 40 feet high. Leaves oblong, lance-shaped, 2 to 3 feet long, marked with numerous fine parallel lines. Flowers fragrant, white, $\frac{1}{3}$ inch across, in dense panicles. Hardy in South-West England and similar parts of Ireland.

C. cannæfolia (Canna-leaved). Stem tall. Leaves oblong, 1 to 2 feet long, with a blunt tip, which is frequently split. Greenhouse.

C. indivisa (undivided). Stem 15 to 20 feet high. Leaves dark green, lance-shaped, 2 to 4 feet long. Greenhouse.

C. terminalis (terminal). Stem branching, 10 to 12 feet high.

Leaves lance-shaped, green, variegated with crimson and bronze. Plate 273.

Cultivation. Few ornamental foliage plants are so easily grown as *Cordylines*. Some of them may be grown out of doors, except during winter, and all except *C. terminalis* are easily accommodated in an ordinary greenhouse. For the decoration of the drawing-room and the dinner-table, small plants are very suitable. The most suitable soil for them is a compost of equal parts good loam and peat, the latter not broken very small; the addition of a little charcoal is desirable. They require plenty of water (less in winter), and frequent syringings. A rather small pot in proportion to the size of the plant will suffice. *C. terminalis* and all the many forms of it known in gardens as stove *Dracænas* require a tropical temperature at all times. Propagation is effected by cutting up the old plants, the top being struck afresh, and the stem cut up into pieces an inch or two long. These are placed in a mixture of cocoanut-fibre and sand, and subjected to bottom-heat in a propagating house or frame, when almost every eye will yield a new plant.

Description of Plate 273. *Cordyline terminalis*, a few of the terminal leaves, greatly reduced.

DRAGON TREE

Natural Order Liliaceæ. Genus *Dracæna*

Dracæna (Greek, *drakaina*, a female dragon). A genus of about thirty-five species of ornamental foliage plants closely allied to *Cordyline*, but with flowers generally larger, and the cells of the ovary containing usually but one ovule. They are widely distributed in Tropical Regions.

Principal Species. Dracæna draco (Dragon). Stem tree-like; when old, much branched, 40 to 60 feet high. Leaves slender, lance-shaped, in a crowded head. Flowers small, greenish white. Introduced from Canary Islands, 1640.

G. godseffiana (Godseff's). A shrubby species with a bamboo-like stem, branching freely and bearing clusters of oval leaves 4 inches long; green, mottled with yellow. Recently introduced from West Tropical Africa.

D. goldieana (Goldie's). Leaves oval, heart-shaped, marbled and banded with dark green, yellowish green, and silvery grey. Flowers

GOLD-RAYED LILY OF JAPAN

(LILIUM AURATUM)

$^3/_4$ Nat. size

PL. 279

white, an inch long, in a dense globular head. Introduced from West Tropical Africa, 1872.

D. SANDERIANA (Sander's). An erect slender-stemmed species, with lance-shaped leaves a foot long, coloured grey-green, with creamy yellow stripes. Recently introduced from West Tropical Africa.

Cultivation. The *Dracænas* here described are all stove plants which require a rich soil, and plenty of moisture and heat at all times. They are propagated from stem-cuttings or divisions.

AFRICAN LILY

Natural Order LILIACEÆ. Genus *Agapanthus*

AGAPANTHUS (Greek, *agape*, love, and *anthos*, a flower). A small genus of tuberous-rooted perennial plants, with long, slender, strap-shaped evergreen leaves, springing from the root and arching. The flowers are large and showy, borne in an umbel on a tall scape. Individually considered, they have funnel-shaped perianths, the tube short, the limb divided into six segments. There are six stamens inserted in the throat of the tube. The ovary is three-celled, with many ovules in each cell, arranged in two series. They are natives of South Africa.

History. *Agapanthus umbellatus* was introduced from the Cape of Good Hope about the year 1692, and there is good reason for believing that it is the only species, the others being mere varieties of it. The only differences are such as are found in variations of size, breadth of leaf, and shade of colouring.

Species. AGAPANTHUS UMBELLATUS (umbelled). Leaves somewhat fleshy. Flower-scape, 2 or 3 feet high. Flowers bright blue, in a many-flowered umbel; July to September. Of the varieties we may mention *albidus*, with smaller white flowers; *aureus*, with yellow streaks down the leaves; *flore-pleno*, with double flowers; *maximus*, with larger blue or white flowers in immense umbels; *minor*, with slender leaves and smaller flowers; *mooreanus*, of dwarfer habit, more narrow leaves, and small darker blue flowers; *variegatus*, with whitish leaves, banded with green.

Cultivation. In the extreme South and South-West of England *Agapanthus* may be regarded as a hardy plant, but in other parts it requires winter protection in greenhouse or conservatory. The most suitable compost for it is a mixture of turfy loam, well-rotted manure, leaf-mould, and river sand. If planted in large pots or tubs for

convenience of taking inside in the autumn, its growth must be watched, and the roots divided from time to time, or the increase of size will result in the bursting of the pot. This division is best effected in spring, and will serve for propagating purposes. During the growing period, and all through the hot, dry weather, they must be very liberally watered. Where there is a lake or stream in the grounds, it is a good plan to turn out these plants into the soft soil on its margins, or to plunge the pots there. The quantity of water given must be greatly reduced in autumn, and given sparingly in winter. When the flower-scapes appear, give occasional dozes of clear manure-water, and continue them until the flowers are all out. They may be wintered in a dry shed or coach-house.

Description of Plate 274. *Agapanthus umbellatus*, the African Lily; umbel of flowers and upper portion of leaves natural size. Fig. 1 is a section of the flower.

SOLOMON'S SEAL

Natural Order Liliaceæ. Genus *Polygonatum*

Polygonatum (Greek, *polys*, many, and *gonu*, a knee: in allusion to the many nodes or joints). A genus of about twenty-three species of perennial herbs, with fleshy, creeping rootstocks and leafy stems. The flowers are produced from the axils of the leaves, and are pendulous. The perianth is funnel-shaped, the mouth cleft into six lobes, and the stamens attached to the middle of the tube. Fruit a pulpy berry. They are natives of Europe, Northern Asia, Himalaya, and North America; three are British.

Principal Species. Polygonatum biflorum (two-flowered). Stem slender, 1 to 3 feet high. Leaves lance-shaped, veins minutely downy, paler beneath. Flowers greenish, ½ inch long, mostly in pairs on one stalk; May. Introduced from North America.

P. multiflorum (many-flowered). Common Solomon's Seal. Stem arched, naked below, 2 to 3 feet high. Leaves oblong, somewhat stem-clasping. Flowers greenish white, ¾ inch long, two to five in a raceme; May and June. Native of Britain. There is a double variety (*flore pleno*), and another with variegated leaves (*striatum*).

Cultivation. *Polygonatums* succeed well in any good, loamy soil, and if planted in a shrubbery or plantation, become quite naturalised. They are propagated by simply dividing the fleshy

SAFFRON LILY

(LILIUM CROCEUM)

$^{2}/_{3}$ Nat. size

PL. 280

rootstocks. If these are potted after the stems have died down in autumn, they may be used for forcing at the end of the year.

LILY OF THE VALLEY

Natural Order Liliaceæ. Genus *Convallaria*

Convallaria (Latin, *convallis*, a valley). A genus of one species, *Convallaria majalis*, with a creeping rootstock, but no stem. Leaves two or three, oval, lance-shaped, stalked, and sheathing one another. Flowers white, fragrant, bell-shaped, with six-lobed mouth, drooping, in a raceme borne on a slender scape; April to June. This favourite native plant is also distributed throughout the greater part of Europe, Northern Asia, and the United States. There are several varieties, including *flore pleno*, with double flowers; *rosea*, with rose-coloured flowers; and *variegata*, with the leaves variegated with yellow.

Cultivation. If the rootstocks are planted in the front row of a shrubbery, where they will get shade and moisture, and their leaves be not too much in evidence in summer-time, it will be found that the plants will take care of themselves, and rapidly increase. An annual top-dressing will greatly help them, and be all the care necessary. They may be grown from seeds, but the simplest plan of propagation is to take up the rootstocks and separate the crowns. Those that are to flower the following year may be readily identified by their greater thickness; and if it is desired to have flowers in December or January, these may be potted for forcing. The pots or boxes are filled with cocoanut-fibre, and the crowns pressed in, with their tips exposed; then cover lightly with moss, keep moist, and subject them to a bottom-heat of about 85° in a propagating frame, from which light is excluded by mats or boards. When they come into flower they are properly potted with care.

TRIPLET LILIES

Natural Order Liliaceæ. Genus *Brodiæa*

Brodiæa (named in honour of J. J. Brodie, a Scots botanist). A genus of about thirty species of hardy or half-hardy bulbous plants, with slender leaves, sheathing at the base, and scapes bearing the flowers in

clusters or umbels. The flowers are funnel- or salver-shaped, with six-parted limb. There are six stamens in two series, but in some species one series consists only of aborted scales. Certain of the species were formerly separated under the name *Triteleia*, by which name they are still known in gardens. They are natives of America.

History. All these plants are modern in relation to gardening. *Brodiæa congesta* and *B. grandiflora* were introduced from North America in the year 1806; *B. laxa* from California in 1832; *B. lactea* in 1833, also from California; and *B. uniflora* from Buenos Ayres in 1836. *B. porrifolia* was received from Chili in 1868. From California, again, came *B. coccinea* (1870), *B. capitata* (1871), *B. multiflora* (1872), *B. gracilis* (1876), and *B. Howellii* (1880).

Principal Species. BRODIÆA CAPITATA (headed). Scape 1 to 2 feet high. Flowers deep violet-blue in a many-flowered umbel; spathe deep violet; May.

B. COCCINEA (scarlet). Scape 1½ foot high. Flowers 1½ inch long, tube blood-red, segments yellowish green; five to fifteen in an umbel; June.

B. CONGESTA (crowded). Scape 1 foot high. Flowers blue, six to eight in a close umbel; July. The aborted stamens form a kind of fleshy crown in the mouth of the perianth. There is a white var. *alba*.

B. GRACILIS (slender). Scape 3 to 4 inches high. Leaf solitary. Flowers ½ an inch long, deep yellow with fine brown lines, a few in an umbel; July. Rather tender.

B. GRANDIFLORA (large-flowered). Scape 18 inches high. Flowers blue-purple; umbels two- to seven-flowered; July.

B. HOWELLII (Howell's). Scape 1½ to 2 feet high. Flowers purplish blue, somewhat bell-shaped, ¾ inch across, in many-flowered umbels; July and August.

B. LACTEA (milky). Scape 1 to 2 feet high. Flowers white, with green veins; saucer-shaped, ¾ inch across, in many-flowered umbels; June and July.

B. (TRITELEIA) LAXA (loose). Ithuriel's Spear. Scapes fragile, 1 to 1½ foot high. Flowers funnel-shaped, blue, 1½ inch long; umbels eight- to twenty-flowered; July.

B. MULTIFLORA (many-flowered). Scape 1 to 1½ foot high. Flowers blue-purple; flowers crowded in umbel, so that it resembles a somewhat globular head; May.

B. (TRITELEIA) PORRIFOLIA (Leek-leaved). Scape 6 or 8 inches high. Flowers funnel-shaped, whitish violet, ¾ inch long; umbels four- to six-flowered; July. Also known as *Milla porrifolia*.

B. (TRITELEIA) UNIFLORA (one-flowered). Spring Starflower.

WHITE, OR ST. JOSEPH'S, LILY

(LILIUM CANDIDUM)

Nat. size

PL. 281

Scapes 6 inches high, one-flowered (rarely two). Flowers pale lilac, $\frac{3}{4}$ to $1\frac{1}{2}$ inch long; May. Also known as *Milla uniflora*. Plate 275.

Cultivation. *Brodiæas* require little more care than most bulbous plants. They succeed best in a light, but rich, well-drained soil with a sunny aspect. Here they may be left undisturbed for several years, during which they will increase by offsets from the bulbs. They may also be propagated by sowing the seeds in sandy soil as soon as ripe. *Brodiæas* make very pretty pot-plants for spring decoration.

Description of Plate 275. *Brodiæa* (*Triteleia*) *uniflora*, the Triplet Lily or Spring Starflower. Bulb, leaves, and flowers of the natural size. Fig. 1 is a section through the flower.

GRAPE HYACINTHS

Natural Order LILIACEÆ. Genus *Muscari*

MUSCARI (Latin, *moschos*, musk: suggested by the odour of the flowers). A genus of about forty species of hardy bulbous plants with slender radical leaves, and globose flowers in racemes. The mouth of the perianth is cleft into six lobes, the stamens are attached to the middle of the tube, and the ovary is egg-shaped, three-lobed, with a short style and simple stigma. The species are natives of Europe (1 British), North Africa, and Western Asia.

History. Grape Hyacinths have been in our gardens for over three hundred years—that is, leaving out of account our own native *Muscari racemosum*, which was probably not overlooked by our early gardeners. In the year 1596 there were growing in English gardens four species from Southern Europe and the Mediterranean Region: *M. botryoides*, *M. comosum*, *M. macrocarpum*, *and M. moschatum*. Not only so, but the curious monstrous form of *M. comosum* had also been introduced. *M. pallens*, a white-flowered species, was introduced from the Caucasus in 1822, *M. commutatum* from Armenia in 1836, and *M. Heldreichii* from Greece in 1869. A number of others have been introduced, but in some cases the record of their native country has been lost, in others the date of their introduction.

Principal Species. MUSCARI BOTRYOIDES (like a bunch of grapes). Scapes 6 to 12 inches high. Leaves glaucous. Flowers deep sky-blue, the mouth-lobes white; in a short, dense, globose cluster; April and May. The var. *album* has white flowers; the var. *pallens* pale blue flowers.

M. COMOSUM (rough). Scapes 1 foot high. Leaves fleshy, pale. Flowers purplish olive, pitcher-shaped, forty to one hundred in a loose raceme: April. Plate 276A. The var. *monstrosum* is a much more attractive plant; in this the flowers are all barren, and each is converted into a tuft of violet-blue slender filaments. This is a little later than the type in flowering. See Plate 276B. Then there is the var. *plumosa*, the Feather Hyacinth, Plate 276C, in which the filaments are much longer, fantastically curled into intricate clusters, and of a more purplish tint. Both these monstrous forms are well worth growing.

M. CONICUM (conical). Scapes erect, 6 inches high. Flowers bright lilac-blue, fragrant, in an oblong-conical raceme; March. Introduced from Italy, but native home uncertain.

M. HELDREICHII (Heldreich's). Scape 8 inches high. Flowers blue, similar in shape to those of *M. botryoides*, but almost twice the size; raceme longer; April. Introduced from Greece, 1869.

M. MACROCARPUM (large-fruited). Flowers fragrant, yellowish, mouth-lobes purple, in loose racemes; April.

M. MOSCHATUM (musky). Musk Hyacinth. Scapes 8 or 10 inches high. Flowers small, purplish, changing to a greenish yellow later, very fragrant; raceme dense, globose; April.

M. NEGLECTUM (neglected). Starch Hyacinth. Scape 6 to 9 inches high. Flowers very dark blue, fragrant, in a dense raceme, thirty- to forty-flowered; March. Native of the Mediterranean Region.

M. PARADOXUM (paradoxical). Leaves three, round, erect. Scape 5 or 6 inches high. Flowers blue-black, green within, faintly fragrant, in a dense conical raceme; April. Introduced from the Caucasus.

M. RACEMOSUM (racemed). Scape 4 to 8 inches high. Flowers dark blue changing to purple, with white mouth-lobes, in dense racemes; odour of Plums; April.

Cultivation. In any garden soil *Muscaris* will do well: but if of a fairly rich and open character, they will rapidly increase without any care being bestowed upon them. They succeed in almost any situation: planted among grass, among rock-work, or as lines or masses in the flower-border, they will be equally at home. It is best to place them where they need not be disturbed; and if they are given a top-dressing of fresh soil before they appear in spring, they will be greatly benefited. They may be increased by means of their abundant seeds, or by taking up the bulbs in autumn, at intervals of two or three years, and separating the numerous offsets. They may be grown in pots, plunged outside in the summer and placed in a little heat in early spring, for the decoration of the conservatory.

SHOWY LILY

(LILIUM SPECIOSUM)

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$^{2}/_{3}$ Nat. size

PL. 282

Description of Plate 276.

Muscari comosum, the Grape Hyacinth. The bulb and normal form of the flowers are shown at A. B is the var. *monstrosum*, with a portion of a filament enlarged in Fig. 3. C is the var. *plumosa*, of which an enlarged fragment is seen in Fig. 2; and Fig. 1 is an enlarged section of a normal flower. A, B, and C represent the natural sizes.

HYACINTHS

Natural Order LILIACEÆ. Genus *Hyacinthus*

HYACINTHUS (a classical name applied to a plant, by some thought to be *Lilium Martagon*). A genus of about thirty species of bulbous perennials with radical strap-shaped or more slender leaves, and flowers in a raceme borne upon a juicy, leafless scape. The flowers are funnel-shaped, or bell-shaped, the perianth with six almost equal segments, which are erect, spreading, or recurved. There are six equal stamens, a nearly globose ovary, and a short style with a three-cornered stigma. The species are natives of the Mediterranean Region, the Orient, and Tropical and Southern Africa.

History.

The history of the genus as garden flowers is really the history of one species, *Hyacinthus orientalis*, the plant that in the present day is so important an item in gardening that nearly six hundred English acres of land in Holland are given up to the preparation of bulbs, for export to Britain and other European countries. These six hundred acres fully employ five thousand persons in Hyacinth culture. In a wild state this familiar species extends its range from Cilicia to Mesopotamia; and without doubt it was introduced from the Levant at a very early date. Matthias de Lobel, in 1576, mentions *H. brumalis* as "the best Hyacinth known in Holland." This was the variety known later as *H. orientalis albus*; but his manner of speaking of it implies that Hyacinth-culture was already an established fact, and that at least several varieties were in existence. It is clear that prior to 1596 several forms had found their way to England, for at that date Gerard had both single and double varieties with blue, purple, and white flowers. Some other colours have arisen as sports, and some from seedlings. The story is extant of the origin of the first lilac variety as a sport from a red-flowered bulb in the possession of a Dutch "fancier," the Rev. Mr. Boekenhoven. He was so fearful that any untoward event—such as the attack of a mouse or rat

upon the bulb—might prevent his perpetuation of the colour, that he imprisoned it in a bird-cage, and hung this from the ceiling of his room. He successfully propagated it, and called it *L'Unique*, a name its progeny still bears among Dutch growers. There has been no exact counterpart to the Tulip mania of last century among admirers of Hyacinths; yet some large prices have been paid for new varieties of Hyacinths. In most cases these have been investments for trade purposes, in order that, by skill in propagation, a new sort might be put upon the market. It is on record that one large and eight small bulbs of the *Non plus ultra* double blue realised the sum of £133, 8s. 6d. at public auction in the year 1734; and at the beginning of the present century a single bulb of the double red *Rouge ébluissante* was sold for £83. It is stated on the authority of Philip Miller, whose *Gardener's Dictionary* is well known, that about 1725 the Dutch growers of Haarlem cultivated about two thousand varieties of Hyacinths.

Although the ordinary garden Hyacinths are the progeny of *H. orientalis*, there are several others in cultivation. *H. amethystinus*, the Spanish Hyacinth, was introduced from the Pyrenees in 1759, *H. corymbosus* from South Africa 1793, and *H. spicatus* from the neighbourhood of Greece in 1826. *H. romanus*, which was introduced somewhere about 1596 from the Mediterranean Region, must not be confounded with the Roman Hyacinth of the Dutch growers, which is the var. *albulus* of *H. orientalis*. Attempts have been made to grow Hyacinth bulbs in England for the market, but the Dutch appear to produce a better article at the price, natural conditions being more in their favour, and the experience of two centuries no doubt counting for a good deal.

Principal Species.

HYACINTHUS AMETHYSTINUS (amethyst blue). Spanish Hyacinths. Leaves slender, as long as, or longer than, the flower-scape (4 to 12 inches). Flowers bright blue, drooping; racemes four- to twelve-flowered, more or less one-sided; April and May.

H. CORYMBOSUS (corymbose). Leaves five or six, fleshy, half-round, pale. Flowers lilac-rose, ½ inch long; racemes four- to nine-flowered, forming a corymb; scape 2 to 3 inches long; autumn.

H. ORIENTALIS (Eastern). *The* Hyacinth. Leaves narrow, lance-shaped, grooved, erect. Flowers frequent, variable, probably blue in the wild state, varying to mauve and white; scape 8 to 12 inches high; April. The var. *albulus*, a native of Southern France, is the so-called Roman Hyacinth of the growers; it has white flowers, with more slender segments, and the tube scarcely swollen at the base, as in the type. The var. *provincialis*, of Southern France, Italy, and Switzer-

SNAKE'S HEAD

(FRITILLARIA MELEAGRIS)

Nat. size

PL. 283

land, has smaller flowers in looser racemes, and more slender leaves.

H. ROMANUS (Roman). Leaves fleshy, somewhat spreading, four or five only. Flowers scentless, white or pale blue, twenty to thirty in a raceme; scape 6 to 12 inches high; May.

Garden Varieties.

These are so numerous, and the names so often misleading, that we do not propose to give a list. Instead, we refer our readers to the autumnal catalogue of a reliable house, in which they will find extensive selections of the best kinds. Varieties with a particular name may be obtained single or double, and in several colours; this is a fact that should be borne in mind when ordering bulbs. Further, if this year you have grown *Grand Vainqueur* white, and are so pleased with it that you determine next season you will try the red or the blue form of the same, it does not follow that you will get a plant similar in all respects except colour. We are told by Heer J. H. Kersten, of Haarlem, that such varieties have not even a common descent from the original *Grand Vainqueur*. He says: "There are, for instance, three different varieties of single blue *Queen of the Blues*, which are kept distinct in Holland [but not in English catalogues] by the additional names of Haarlem, Overveen, or Hillegom *Queen of the Blues*. Thus we have the pleasure of noting three distinct varieties which are named alike, and yet which is the true Queen amongst all these Queens no Dutchman will undertake to decide" (*Journal Roy. Hort. Soc.* xi. p. 61). It may be added that for pot- or glass-culture single varieties should be selected, as giving the more satisfactory results. A few doubles may be used in pots, but not in glasses.

Culture.

Imported bulbs contain sufficient food for a season's flowering, therefore the soil is a matter not of the greatest importance—they may be flowered well, as we all know, with their roots in pure water. But when we look forward to the increase of the bulbs, and their preparation for flowering next year, the question of suitable soil is of great moment. A well-dug sandy soil of great depth, enriched with thoroughly rotted cow-manure, is the best. Fresh manure should never be used with bulbous plants. The Dutch bulb-farmers enrich their ground with cow-manure, and take a crop of potatoes from it before planting their bulbs. Hyacinths should be planted out of doors in October, taking care that all are placed at an equal depth; this should be such that the crowns of large and small bulbs alike are just three inches below the surface. It is a good plan to put a little fine sand immediately below the bulb, and a little more above it. If a bed is to be filled with hyacinths, or lines or

patterns worked with them, there should be equality in the size of the bulbs, otherwise the results will not be so neat and regular as you desire. A covering of cocoanut-fibre refuse will keep the leaves and flowers clean. Before the flowers actually open, each spike should be supported by tying lightly to a neat stick, which, however, should not reach to the top of the spike. The bulbs should not be disturbed until the leaves have turned yellow and begun to shrivel. Then they should be dug up, dried slowly in the shade, and when the leaves have quite withered, these should be cut off at the base, and the bulbs placed in paper bags and stored away in a dry place.

For pot-culture a special compost should be prepared two or three months before using, and should consist of fibrous loam, two parts, thoroughly rotted cow-manure, one part, leaf-mould, one part, and river sand, one part. Clean 5- or 6- inch pots should be used and perfect drainage ensured. Fill in sufficient of the compost to bring the crown of the bulb within half an inch of the rim of the pot. Let the bulb rest on a little clean sand, then fill in the compost firmly round it, until only the crown just shows, and cover that with a little more sand. Prepare a hole or pit outside, with a bottom of coal ashes, and fill with cocoanut-fibre refuse. In this plunge your potted Hyacinths, covering their tops with about four inches of fibre. Under these conditions the bulbs will send out roots freely; and in about six weeks from their interment the pots may be taken up, and put into a cool greenhouse. It will be found that the leaves have also started, but are too tender to bear sudden exposure; therefore, cover each by inverting a smaller-sized flower-pot over the plant, and leave them covered for a few days. They may now be placed near the glass and allowed to come on gradually, or removed to a warmer—but not *hot*—house for forcing. The temperature must not be raised suddenly, but graduated according to the date at which plants in full blossom are required. If the main stock is kept in a cool house, a few pots may be brought under higher temperatures in succession, and so the supply of flowers indoors kept up until those outside are coming on. Bulbs that have been flowered in pots require careful and very gradual ripening, or they will be of no use for succeeding years.

To our mind the growth of Hyacinths in water is not a thing to recommend, for they look unnatural and ungainly; but where it is desired to grow them in this fashion, the tall, specially-made vases should be used. Only the best single bulbs should be selected for this purpose. About the middle of October the glasses should be quite filled with clean water, and with it a few nibs of charcoal. The base of the bulb must

GARDEN TULIP

(TULIPA GESNERIANA)

Nat. size

PL. 284

at first be in contact with the water, but after the roots have grown an inch long the water should be reduced so that it is half an inch below the bulb. As soon as the bulbs are placed in position, remove glasses and all to some dark, dry, cool, and airy place: in a close, damp cupboard the bulbs will probably mildew and the leaves grow long and white. Unless the water smells offensively it should not be changed; neither should the bulb be lifted, except to pour in sufficient water to make up for what the roots have absorbed. Examine them from time to time to see that all is right, and in about a month's time the glasses will be found fairly filled with roots. Gradually let in light, until the glasses can be placed in their permanent positions in the window, near the glass. The glasses selected for this form of culture should be fitted with wire supports for the long, heavy flower-spikes.

Description of Plate 277. *Hyacinthus orientalis*, the Garden Hyacinth. The bulb, leaves, and two forms of the flowers are shown. Fig. 1 is a section of a single flower; 2, the ovary and style; 3, a transverse section of the ovary.

SQUILLS

Natural Order Liliaceæ. Genus *Scilla*

Scilla (the old Greek name for these plants). A genus of about eighty species of bulbous perennials with slender, radical leaves, and usually blue flowers, borne in racemes on simple, leafless scapes. The perianth consists of six segments, nearly equal, free or slightly connected at the base. There are six stamens, with flattened filaments and oblong anthers. The ovary is egg-shaped, with a thread-like style and minute stigma. The fruit is a triangular, three-valved capsule, containing many black seeds. The distribution of the species is chiefly European (three British), Western Asian, and Extra-tropical African.

History. Of this extensive genus of bright little flowers we have the good fortune to possess three native species, of which, however, only one, the familiar Wild Hyacinth or Bluebell, *Scilla nutans*, is at all widely distributed. Of the exotic species, *S. hyacinthoides* has been longest in our gardens, its introduction from South Europe having taken place about 1585. Between that date and 1596 *S. amœna*, the Star Hyacinth, came from the same neighbourhood, as also *S. italica* in 1605. The strangely named Cuban Lily, *S. peruviana*, which is really a native of Algeria and neighbouring countries, was introduced, *viâ* Spain, in 1607.

S. hispanica, from Spain and Portugal, came to us first in 1683. The exceedingly popular Siberian Squill, *S. sibirica*, which is a native of Asia Minor, was introduced in 1796. *S. chinensis* came from China in 1826, and *S. pratensis* from Dalmatia in the following year. Many others have been introduced and may occasionally be seen in gardens, but these are those of chief horticultural interest. The undermentioned are all hardy, unless otherwise described.

Principal Species.

SCILLA AMŒNA (pleasing). Leaves four or five, soft, shiny, 6 to 9 inches long. Flowers blue (rarely whitish), nearly ½ inch long; raceme three- to six-flowered; scape weak, 4 to 6 inches high; March.

S. AUTUMNALIS (autumn). Leaves produced in autumn after the flowers, half-round, grooved on upper surface. Flowers reddish purple, ½ inch across; racemes few-flowered; scapes several, 3 to 6 inches high; July to September. Native.

S. BIFOLIA (two-leaved). Leaves usually two only, concave, 4 to 8 inches long. Flowers blue, occasionally reddish or whitish, half an inch across, three to eight in a raceme; scape solitary, 3 to 6 inches high; March. The var. *præcox* is a more robust form, with larger and more numerous flowers (ten to fifteen), which appear earlier, and thicker, broader leaves. One form of this variety has reddish flowers.

S. CHINENSIS (Chinese). Leaves two or three, firm, upper surface channeled. Flowers very small, rose-purple, twenty to sixty in a raceme; scape slender, 1 foot high; June. Half-hardy.

S. HISPANICA (Spanish). Spanish Bluebell; Large Squill. Leaves five or six, smooth, convex at back. Flowers somewhat globular, bell-shaped, blue, changing to rosy purple or whitish; six to twelve in a loose raceme; scape 6 to 9 inches high; May. Several colour varieties are catalogued by the dealers.

S. HYACINTHOIDES (Hyacinth-like). Leaves ten to twelve, spreading, about an inch broad in the middle, narrowing to each end, edges delicately fringed. Flowers small, bluish lilac, fifty to one hundred and fifty in a raceme; scape 1 to 2 feet high; August.

S. NUTANS (nodding). Bluebell (in England); Wild Hyacinth. Leaves about six, concave, 1 to 1½ foot long. Flowers blue or purple, occasionally white or pink, drooping; six to twelve in a raceme; scape solitary, stout, tall; April to June. Native. There are several white and red garden forms.

S. PERUVIANA (Peruvian). Cuban Lily. Leaves six to nine, about a foot long, the margins densely fringed with small white bristles. Flowers lilac, reddish or whitish; the segments green-striped, half an inch

PARROT TULIP

(TULIPA GESNERIANA, *var. dracontia*)

Nat. size

PL. 285

long; fifty to one hundred flowers in a broad, dense raceme; scape stout, 6 to 12 inches high; May. There is a var. *alba*.

S. SIBIRICA (Siberian). Leaves two to four, nearly erect, 4 to 6 inches long. Flowers one to three on a scape, deep blue, ½ inch long, segments spreading; scapes one to six to a bulb, 3 to 6 inches high; February. Plate 278.

S. VERNA (spring). Sea Onion. Leaves 3 to 10 inches long, concave, recurved. Flowers bright pale blue, ½ inch across, fragrant, six to twelve in a raceme; scapes one or two, shorter than leaves; April. Native.

Cultivation. *Scillas* are among the convenient class of plants that do well in most garden soils, and only require planting. This should be done about October, when the bulbs are ripe and dormant. They should be placed in situations where they may be allowed to remain for several years without interference. They do well in the rock-garden, the herbaceous border, where dwarf Saxifrages, *Arabis*, and plants of similar dwarf habit may be planted over them; or in the wild garden amongst grass. *S. sibirica* and several others will do well in pots, if these are stood in a cold house. *S. peruviana* is a greenhouse plant. Where bulbs can be obtained in quantity, they should be planted along woodland walks in little clumps, which will soon spread, especially if the seeds are allowed to sow themselves.

Description of Plate 278. *Scilla sibirica*, the Siberian Squill; natural size. Fig. 1 is a section of the bulb; 2, the unexpanded flower-bud; and 3, a section through the flower.

LILIES

Natural Order LILIACEÆ. Genus *Lilium*

LILIUM (the old Latin name). A genus of about forty-five species of perennial bulbous herbs, whose bulbs are composed of many overlapping fleshy scales. The leaves all originate from the stem, and are either alternate or in whorls, of variable shape, and sometimes with little bulbils in the axils. The flowers are large and showy, honeyed, of six entirely unconnected perianth-segments, which drop off when fertilisation has been effected. There are six stamens attached round the ovary or to the base of the segments; the filaments long and awl-shaped, the anthers large and attached above the base, so that they swing lightly poised on the tip of the filaments. The ovary is six-grooved, the style rounded, the stigma blunt, and the cells containing many ovules. The

fruit is an erect, many-seeded capsule. The species are natives of the Temperate Regions of the Northern Hemisphere.

History. We have no species of *Lilium* indigenous to Britain, though *L. Martagon* has long been naturalised in a restricted area of Surrey. This was one of the first species to have been introduced to this country, for we find that it was growing in English gardens with *L. candidum*, *L. chalcedonicum*, *L. croceum*, *L. bulbiferum*, and *L. pyrenaicum* (a sub-species of *L. pomponium*) as far back as 1596. All these are European species, and they were joined about 1629 by *L. pomponium* from Northern Italy, and *L. canadense* from North America. In 1745 *L. davuricum* came from Siberia, *L. philadelphicum* from North America in 1757, and *L. Catesbæi* from the same region in 1787. Many species have been introduced during the present century. Among the most notable of these are several from Japan, beginning with *L. japonicum*, 1804, *L. elegans*, 1820, *L. longiflorum*, 1820, *L. speciosum*, 1832, *L. cordifolium*, 1853, *L. auratum*, 1862, *L. Hansoni*, 1865, and *L. Leichtlini*, 1867. From China came *L. tigrinum*, 1804, and *pseudo-tigrinum*, 1867. From Himalaya we received *L. roseum* and *L. giganteum*, 1852; and from California, *L. washingtonianum*, 1872, *L. pardalinum*, 1875, and *L. Parryi*, 1879.

Principal Species. LILIUM AURATUM (golden). The Golden-rayed Lily. Stems purplish, round, 2 to 5 feet high. Leaves slender, lance-shaped, 6 to 9 inches long. Flowers 10 to 12 inches across, highly fragrant, white, with a band of bright yellow down the centre of each segment, which is also spotted with carmine, and the base thickly studded with fleshy excrescences; July and August. The racemes are short, and consist of from three to twenty flowers. This is the most magnificent of the genus. Plate 279. There are several named varieties of it.

L. BULBIFERUM (bulb-bearing). Stem furrowed, downy, 2 to 4 feet high. Leaves slender, numerous; the upper ones with purple-brown bulbils in their axils. Flowers reddish yellow, erect, the segments suddenly narrowing below to form a distinct claw; raceme twelve- to eighteen-flowered; June and July.

L. CANADENSE (Canadian). Stem round, 2 to 3 feet high. Leaves lance-shaped, usually in distinct whorls. Flowers 2 to $2\frac{1}{2}$ inches long, varying from bright yellow to pale red, much spotted with purplish red; drooping, in few-flowered corymbs; June to August.

L. CANDIDUM (white). St. Joseph's Lily; Madonna Lily. Stem $\frac{1}{2}$ to $\frac{3}{4}$ inch thick near base, stiff, 2 to 3 feet high. Leaves slender, much crowded on the lower half of stem, short and scattered above. Flowers

TULIPA SUAVEOLENS

Nat. size

PL. 286

pure white, 2 or 3 inches long, lower ones drooping, upper more erect; racemes five- to twenty-flowered; June. Plate 281.

L. CATESBÆI (Catesby's). Stem 2 to 3 feet high, stout. Leaves scattered; lower ones lance-shaped, upper ones narrower and shorter. Flowers solitary, 3 to 4 inches long, bright orange-red, spotted with purple; July and August.

L. CHALCEDONICUM (Chalcedonian). Stem finely channeled, stiff, 2 to 3 feet high. Leaves slender, scattered, lower ones somewhat spreading, upper ones erect. Flowers bright scarlet, occasionally yellowish, drooping, one to six in a corymb; July and August.

L. CORDIFOLIUM (heart-leaved). Stem 3 to 4 feet high. Leaves heart-shaped on long stalks; lowest ones reddish. Flowers funnel-shaped, narrow; white, yellow, or purple, in four- to ten-flowered racemes; August.

L. CROCEUM (saffron colour). Saffron Lily. Stem cobwebby, purple-spotted, 3 to 6 feet high. Leaves slender, variously disposed. Flowers of a brilliant orange- or saffron-colour, with small crimson or purple spots; August. Similar to *L. bulbiferum*, but easily distinguished by the cottony hairs on the flower-stalks, and the absence of bulbils in the axils. Plate 280.

L. DAVURICUM (Dahurian). Stem slender, 2 to 3 feet high. Leaves slender, three nerved. Flowers bright scarlet, in an umbel-like raceme; foot-stalks sometimes slightly cobwebby; July.

L. ELEGANS (elegant). Stem sometimes forking near top, 3 to 4 feet high. Leaves lance-shaped, an inch broad. Flowers pale scarlet, slightly spotted, 5 or 6 inches across; July.

L. GIGANTEUM (gigantic). Stem round, erect, 4 to 10 feet high, and 2 to 4 inches thick at base. Leaves heart-shaped, all except the uppermost, with long, broad, channeled leaf-stalks, whose bases clasp the stem. Flowers funnel-shaped, 5 or 6 inches long; white, the throat tinged with purple; six to twelve in a raceme; July and August. Except in sheltered parts of the South of England this species must be grown in the cool greenhouse. It dies after once flowering.

L. HANSONI (Hanson's). Stem slender, round, smooth, 3 to 4 feet high. Leaves lance-shaped, smooth, mostly in whorls. Flowers reddish-orange, spotted with purple, about $1\frac{1}{2}$ inch long, four to ten in a raceme; June and July.

L. HENRYI (Henry's). Stems 6 to 10 feet, clothed with lance-shaped leaves, and bearing a loose raceme of from twenty to fifty flowers, like those of *L. speciosum*, but coloured lemon-yellow. A recent introduction from Central China. Hardy.

L. JAPONICUM (Japanese). Stem rounded, stiff, 1 to 2 feet high. Leaves lance-shaped, not distinctly stalked; twelve to twenty, scattered. Flowers funnel-shaped, 5 or 6 inches long, white, purple-tinged outside, in twos or threes (solitary in the wild plant); July and August. A rather delicate species.

L. LEICHTLINII (Leichtlin's). Stem slender, 2 to 3 feet high. Leaves very slender, broader below the middle, scattered. Flowers solitary or twin, yellow, thickly spotted with purplish red; $2\frac{1}{2}$ to 3 inches long; July and August.

L. LONGIFLORUM (long-flowered). Stem rounded, stiff, 1 to 2 feet high. Leaves slender; lower ones crowded. Flowers 5 to 7 inches long, funnel-shaped, pure white, fragrant; solitary or twin; June. The var. *eximium* is known in gardens as *L. Harrisii*, the Bermuda or Easter Lily, and is in great demand for early forcing.

L. MARTAGON (the old popular name). Martagon Lily, or Turk's Cap Lily. Stem rounded, downy, 2 to 3 feet high. Leaves lance-shaped, usually in whorls of six to nine. Flowers dull purplish red, thickly dotted with dark purple, the segments curved back around the tube, and the flower hanging downwards, in a long raceme; July.

L. PARDALINUM (leopard-like). Stem 3 to 7 feet high. Leaves narrow, lance-shaped, mostly in whorls of from nine to fifteen. Flowers nodding, bright orange-red, lighter in the centre, which is spotted with purple; July and August.

L. PARRYI (Parry's). Stem slender, 2 to 6 feet high. Leaves slender, lance-shaped, usually scattered, lower ones sometimes in a whorl. Flowers fragrant, pale yellow, spotted with reddish brown; horizontal; July.

L. PHILADELPHICUM (Philadelphian). Stem slender, rigid, 1 to 3 feet high. Leaves narrow, lance-shaped, in regular whorls of from six to eight leaves. Flowers solitary or in umbels, 2 to 3 inches long, not opening widely; bright orange-red, usually spotted with purple in the centre; July and August.

L. POMPONIUM (Pompone). Stem finely furrowed, stout, stiff, $1\frac{1}{2}$ to 3 feet high. Leaves slender, edges rolled inwards, fringed; very numerous and scattered. Flowers bright red, sometimes orange-tinged; about twenty in a broad raceme; July and August.

L. PSEUDO-TIGRINUM (false tiger-lily). Stem 3 to 4 feet high. Leaves slender, the edges curled back, scattered. Flowers beautiful scarlet, plentifully dotted with black; style and stamens red; four to six in a loose raceme; July.

L. PYRENAICUM (Pyrenean). Very similar to *L. pomponium*, of

EICHHORNIA CRASSIPES

$^{2}/_{3}$ Nat. size

PL. 287

which it is probably a sub-species. It is, however, taller, and the flowers are bright yellow, instead of red; about twelve in a raceme.

L. ROSEUM (rose-coloured). Stem rounded, smooth, 18 inches high. Leaves grass-like, alternate, except at base, where they are crowded, and more than a foot long. Flowers large, lilac, drooping, in a raceme; April. A rather tender species, singular in having a dense bulb invested in a dry membranous coat like that of the Tulip.

L. SPECIOSUM (showy). Stem rounded, rigid, 1 to 3 feet high. Leaves lance-shaped, lower ones more oval. Flowers variable in size and colour, but typically white, spotted and tinged with carmine or rose, and from 3 to 5 inches long; from three to ten in a raceme; July and August. Commonly known in gardens as *L. lancifolium*. Plate 282.

L. TENUIFOLIUM (slender-leaved). Stem slender, 6 to 12 inches high. Leaves small, needle-like, numerous. Flowers solitary, rarely twin, somewhat drooping, bright scarlet, 1¼ inch long; June and July. Introduced from Siberia, 1820.

L. TIGRINUM (Tiger). Tiger Lily. Stem stout, purplish black, covered with white down, 2 to 4 feet high. Leaves slender, dark, glossy, irregularly scattered, usually with round black bulbils in the axils. Flowers 3 to 4 inches long, deep orange-red, with numerous purple-black spots; racemes eight- to twenty-flowered; July and August. As in the case of some of the foregoing species, there are several varieties: among them *flore pleno*, with double flowers; *Fortunei*, of greater stature, with larger pyramidal racemes; *splendens*, with fewer and larger spots on the flowers.

L. WASHINGTONIANUM (Washington's). Stem rounded, stiff, 3 to 5 feet high. Leaves lance-shaped, 4 or 5 inches long, whorled, about twelve in each whorl. Flowers fragrant, 2½ to 3 inches long, white, tinged with purple or lilac, in large racemes; July and August.

Cultivation. An open, well-drained soil is the most suitable for growing Lilies, as, given good drainage, additions of peat, loam, etc., will make it fit for any species. The bulbs should be planted at a depth of about 6 inches, a hole of greater depth having been dug previously and partly filled with specially suitable soil. *L. candidum*, *L. Martagon*, and *L. washingtonianum* should have a good admixture of heavy loam with the ordinary soil; whilst *L. auratum*, *L. Catesbœi*, *L. Leichtlinii*, *L. pardalinum*, *L. philadelphicum*, and *L. tenuifolium* require for their successful culture a proportion of peat. Nearly all Lilies appreciate peat, even those to which it is not a necessity. Leaf-mould and well-rotted cow-manure, or the remains of an old hot-bed, worked up with good loam, will be found helpful. Where there are beds

devoted to Rhododendrons or other shrubs of low stature, Lilies may be planted with advantage in between. In such a position the bulbs will be perfectly secure from frosts in winter, and the tender shoots from strong winds in spring, whilst the flowers will show up well against the bold foliage of the shrubs. The bulk of the Lilies at Kew are grown in this way, and are a great success. Strong manures should not be allowed to come near the bulbs, but well-rotted manure, applied as a mulching as soon as the flower-buds begin to form, is of great value. A plentiful supply of water at the same period is very important. Lily-bulbs should remain undisturbed for several years. If their removal is necessary, it should be done in autumn, when the stems have died down; but they should be at once replanted, for exposure to the air soon renders them flabby.

Pot-culture. Most of the species of *Lilium* are well adapted for pot-culture, and an admirable compost for them may be contrived by mixing loam and peat in equal portions, and adding to it a little charcoal and some sharp sand. The pots must be adapted to the size of the bulbs, but a 6-inch pot will be found *small* enough for any of them. The bulb should be inserted deeply, but with a good layer of soil beneath it. Lilies root not merely from the base of the bulb, but as soon as the stem is formed a circlet of roots emerges from the thick portion of the stem, and these take possession of the top layer of soil, which should not be allowed to get dry. When the buds are formed—but not till then—clear liquid-manure may be given; and after flowering, the pots should be stood outside, and less water given. When the stems have died in autumn the bulbs may be shaken out, and at once repotted in fresh soil. During the winter they should have a cool corner of the greenhouse where they will be free from frost and not entirely dry. During this period their roots will be not inactive, therefore the soil, though not very damp, must be permeable.

Propagation. Healthy Lilies propagate themselves. The bulb that sent up one stem last year will send up two or three this season, and the fleshy scales will rearrange themselves around these stems; so that the original bulb becomes two or three. These, of course, may be separated from time to time. If the flowers are allowed to ripen their seeds, these may be sown in pans of sandy soil; but as flowering bulbs cannot be produced from these seeds in less than about five years, the amateur will probably prefer the more expeditious mode already mentioned. The bulbils produced in the axils of some species should also be utilised; and often a vast number of minute bulbs will be formed among the scales of the old bulb, which they soon break up. A single

CURLY PALM

(HOWEA BELMOREANA)

Greatly reduced

PL. 288

scale of a bulb that may get separated in handling will produce several of these tiny offsets if placed in soil, though, of course, these small bulbs will take several years to attain flowering strength. They should be planted out of doors in a specially prepared bed containing a good proportion of thoroughly rotted cow-manure, in conjunction with peat and good loam, where they will make rapid progress.

Description of Plates 279 to 282.

Plate 279. *Lilium auratum*, the Gold-rayed Lily of Japan. A flower, about one-third less than the natural size.

Plate 280. *Lilium croceum*, the Saffron Lily, one-third less than natural size. Fig. 1, section of ovary, with stamens.

Plate 281. *Lilium candidum*, St. Joseph's Lily, natural size. Fig. 1, flower after removing the perianth-segments.

Plate 282. *Lilium speciosum*, the Showy Lily. Bulb natural size, flowers reduced one-third. The stem-roots referred to on page 604 are well shown here. Fig 1 is a section through the ovary.

CROWN IMPERIAL AND SNAKE'S-HEAD LILIES

Natural Order Liliaceæ. Genus *Fritillaria*

Fritillaria (Latin, *fritillus*, a dice-box or chess-board, from the checkered pattern of the flower in some species). A genus of about fifty species of bulbous perennials. The bulb consists of a few thick scales, and the stem bears stalkless leaves and drooping flowers. These are bell-shaped, with the six perianth-segments free to the base, each bearing a hollowed honey-gland at its base. The stamens are attached at the very base of the segments. Ovary three-sided, style three-grooved, stigma three-lobed. The species are distributed throughout the Temperate Regions of the Northern Hemisphere; one British.

History.

Fritillaria Meleagris, the Snake's-head, is numbered in the British Flora as a plant of local occurrence in moist meadows, although there are not wanting those who suspect that its presence here is due to man's agency in a forgotten past. It is quite certain that garden enthusiasts at an early date began to introduce *Fritillarias*, for in the year 1596 two species other than *F. Meleagris* were in cultivation here. These were *F. imperialis*, the Crown Imperial, and *F. persica*, both from Persia. Among other early introductions were the var. *latifolia* of *F. lutea*, from the Caucasus in 1604, of which the type was not brought hither until 1812. *F. pyrenaica*, from the Pyrenees,

was introduced in 1605. The others now in cultivation have all been introduced within the nineteenth century; including *F. lutea*, from the Caucasus, 1812; *F. tenella*, from the Maritime Alps, 1867; *F. recurva*, from California, 1870; *F. tulipifolia*, from the Caucasus, 1872; *F. Hookeri*, from Sikkim, 1878; and *F. pallidiflora*, from Siberia, 1880.

Principal Species.

FRITILLARIA ARMENA (Armenian). Stem 6 inches high. Leaves lance-shaped. Flowers solitary, yellow. Introduced from Asia Minor, 1878.

F. HOOKERI (Hooker's). Stem 6 inches high. Leaves slender, 8 inches long. Flowers about an inch long, pale lilac, in a raceme; July.

F. IMPERIALIS (imperial). The Crown Imperial. Stem 3 feet high. Leaves lance-shaped in a series of whorls, about midway up the stem, which is also terminated by a tuft of leaves above the flowers. Flowers drooping, varying from yellow to crimson, in a whorl beneath the terminal leaves; April. There is a double var. *flore pleno*; var. *purpurea*, with purplish flowers; var. *variegata*, with yellow-bordered leaves; and several florists' varieties.

F. LUTEA (yellow). Stem 6 to 12 inches high. Leaves slender, lance-shaped, alternate. Flowers solitary, drooping, yellow, tinged with purple; April and May.

F. MELEAGRIS (Guinea-fowl). Snake's Head; Common Fritillary. Stem 1 foot high. Leaves alternate, long and slender. Flowers solitary, rarely twin, 1½ inch long, pale and dark purple in a small checkered pattern; April. Plate 283. There are white (var. *alba*) and double-flowered (var. *flore pleno*) varieties.

F. PALLIDIFLORA (pale-flowered). Stem 9 inches high. Leaves glaucous, large. Flowers pale yellow, the interior checkered; May.

F. PERSICA (Persian). Stem 3 feet high. Leaves lance-shaped. Flowers faintly scented, small, deep violet-blue or dull purple, in racemes; April and May.

F. PUDICA (chaste). Stem 6 to 9 inches high. Leaves very slender, glaucous, alternate. Flowers dark yellow, usually solitary, occasionally twin; May. Native of North-West America.

F. PYRENAICA (Pyrenean). Stem 1½ foot high. Flowers large, plum-coloured, yellow within, netted with brown; June.

F. RECURVA (recurved). Stem 2 feet high. Leaves lance-shaped. Flowers large, bright scarlet, the perianth-segments curved back; solitary in the axils; stem one- to nine-flowered; May.

F. TULIPIFOLIA (Tulip-leaved). Stem slender. Lower leaves reduced to sheaths; upper ones elliptic, lance-shaped, concave. Flowers solitary,

SPINY DATE PALM

(PHŒNIX SPINOSA)

Greatly reduced

PL. 289

Lithogr. W. Muller, Cera

nodding, glaucous blue without, rusty purple within; outer segments streaked with purple outside; March.

Cultivation. All the species described are hardy, and they will succeed in any well-drained border where the soil is of a fairly rich character. Although less exacting in the matter of soil even than Lilies, the directions given for the treatment of the latter may be followed closely in the case of *Fritillarias*. A similar remark may be applied to the propagation of the two genera by means of seeds and offsets. *F. Meleagris* is an excellent plant for grassy slopes or the wild garden.

Description of Plate 283. *Fritillaria Meleagris*, the Snake's Head; natural size. Fig 1 is a vertical section of the flower; 2, a transverse section of the ovary.

TULIPS

Natural Order Liliaceæ. Genus *Tulipa*

Tulipa (said to be the Persian *thoulybun*, or *tulipan*, and the Turkish *tulbend*, a turban, Latinised). A genus of about sixty species of hardy bulbous herbs, the bulbs composed of thick scales rolled one in another. The leaves are narrow, lance-shaped or slender, originating from the bulb and from the stem, the lower ones sheathing. Flowers usually solitary, erect or (very rarely) nodding; bell-shaped, the perianth of six segments, free to the base, with the tips curved back. The six stamens are shorter than the perianth, and are attached at its base, surrounding the three-angled ovary and its three-lobed stigma. The seed capsule is erect, leathery, and many-seeded. The species are natives of Europe (one British), North Africa, North and West Asia.

History. *Tulipa sylvestris*, the bright yellow-flowered wild Tulip occurs naturally in parts of England, but for a period of three hundred and twenty years we have had *Tulipa gesneriana*, from Asia Minor, flourishing in our gardens. This plant had been grown at Augsburg from seeds introduced from the Levant, and there, in 1559, it was seen by Conrad Gesner, who forthwith made a drawing and description of it. Gesner fell a victim to the Plague in 1565, but his works, containing much that is curious and interesting to the naturalist, still live. It was a characteristically happy thought of Linnæus to attach Gesner's name to the species, so that it is still *Tulipa gesneriana*, or Gesner's Tulip. It was in cultivation here in 1577, and from it has originated, by sports and seed-bed variation and hybridising, such a

progeny that no man can accurately number. Most of the late-flowering sorts found in our gardens are in some close fashion related to *T. gesneriana*, whilst the very early Van Thol's and others are similarly descended from *T. suaveolens*, a native of the Crimea, which reached us from Southern Europe about 1603. In 1636 we received *T. clusiana*, Clusius', or the Lady Tulip, also from South Europe. Many have been introduced since then, but very few have found their place in horticulture. Of those that have received the florist's care, *T. oculus-solis* was introduced in 1816 from the South of Europe, and from the same part of the Continent came *T. præcox* in 1825. *T. pubescens* appeared about a year earlier; but no one knows whence it came, and it is suspected of originating in a garden, as the result of a cross between *T. gesneriana* and *T. suaveolens*; from it, in turn, have come such favourite varieties as *Pottebakker* and the *Bride of Haarlem*. The showy *T. Greigi* was introduced only in 1873, from Turkestan, and in the following year came *T. Eichleri*, from Georgia, in Asia Minor; but many hybrids and varieties of these have been produced in our gardens, though not so many as might be inferred on perusal of the lists of dealers, for it is well known that some of these are catalogued under several different names.

Like Orchids and Hyacinths, Tulips have at times been remarkable for the high prices paid for new varieties. On the appearance of a new and striking form among flowering seedlings, growers have not hesitated to invest large sums of money in order to get the control of the market for a time, so far as that variety is concerned, just as an engineer will pay for the patent of an improved piece of machinery, or as a publisher may invest in a copyright. It is not many years since £100 was offered and refused for a single bulb of *Louis XVI.*; but, as a rule, high prices in the present day are fixed, as a deterrent, by those who do not wish to sell. The so-called Tulipomania of the first half of the seventeenth century had really but a slight connection with the cultivation and love of Tulips: it was one of the numerous forms in which the gambling vice breaks out at different times. To-day it concerns itself chiefly with the purchase and sale of stocks and shares that often have no real existence, and in the 1630's men made and lost fortunes in the purchase and sale of bulbs that never changed hands, even if they actually existed. Griffins and Unicorns of the heraldic types might just as well have been the subjects of the "speculation." The amateur of limited means may grow a pretty extensive collection of good Tulips without running any risk of having to place his affairs in the hands of the Official Receiver as a consequence.

TRACHYCARPUS EXCELSUS

Young plant

PL. 290

Principal Species and Hybrids.

TULIPA AUSTRALIS (southern). Similar to our native *T. sylvestris* (which see), but smaller in all its parts. Flowers more funnel-shaped, yellow, tinged outside with bronzy red. Native of South-Western Europe; also known as *T. celsiana*.

T. CLUSIANA (Clusius'). The Lady Tulip. Bulb small, densely hairy. Stem slender, 1 to 1½ foot. Leaves four or five, long and slender, channeled. Flowers white, the outside flushed with red, and purplish black at base; stamens black; June.

T. EICHLERI (Eichler's). Similar to *T. gesneriana* (see below), but distinguished by the downy flower-stalk. Flowers bright crimson, with a yellow-bordered black basal blotch; April and May.

T. ELEGANS (elegant). Flower-stalk slightly downy. Flowers bright red; segments with pointed tips; April or May. Of garden origin; believed to be a hybrid between *T. acuminata* and *T. suaveolens*.

T. GESNERIANA (Gesner's). Bulb large, the outer coats with a few hairs on the inner surface. Leaves broad. Flowers variable, more or less striped with white, yellow, violet, or red; apex of segments broadly rounded; flower-stalk tall, and free from down; May and June. Plate 284. The Parrot or Dragon Tulips are considered to be descended from *T. gesneriana*, var. *dracontia*. The flowers of these are brilliantly coloured, of large size, and the edges of the segments deeply toothed and slashed. Plate 285.

T. GREIGI (Greig's). Stem about 9 inches high. Leaves broad-oblong, glaucous, blotched with brown. Flowers flame-coloured, nearly 3 inches long, each segment marked with a yellow-bordered, oblong, black patch; April.

T. OCULUS-SOLIS (sun's-eye). Stem 12 to 18 inches high. Leaves slender, lower ones a foot long. Flowers 2½ to 3 inches long, bright red, the segments having at the base a yellow-bordered, lance-shaped, black patch; April.

T. PRÆCOX (early). Very similar to the last, but of more robust habit, earlier flowering, and with more oval segments, more overlapping, and with the basal blotch less clearly defined.

T. PUBESCENS (downy). The flowers are faintly fragrant, but vary greatly in colour. It is believed to be a hybrid of garden origin. It has the large stigma and blunt-tipped segments of *T. gesneriana* and the downy flower-stalk of *T. suaveolens*.

T. SUAVEOLENS (sweet-smelling). Sweet Tulip; Van Thol's Tulip. Stem 6 inches high. Leaves broad. Flowers large, fragrant, red, yellow, or some combination of these colours; the segments with acute tips; flower-stalk very downy; March and April. Plate 286.

T. SYLVESTRIS (growing in woods). Bulb small, with brown scales. Stem 1 to 2 feet long, somewhat zigzag. Leaves few and slender, glaucous. Flowers fragrant, bright yellow, 2 inches long; segments broad, lance-shaped; April and May.

A large number of species of *Tulipa* have been introduced within the last ten years from Asia Minor, but they are known only to botanists and a few specialists.

Garden Varieties. The number of these is so great that they have had to be organised into classes, and even these classes are increasing in number. Primarily, we may distinguish a division into Early and Late-flowering Tulips. The Early-flowering are divided into Singles and Doubles; but the classification of the Late-flowering is not nearly so simple. First, these are separated under the heads of Bizarres, Byblœmens, Roses, Parrots, and Darwins; second, they are divided into Feathered Bizarres, Flamed Bizarres, Feathered Byblœmens, Flamed Byblœmens, Feathered Roses, Flamed Roses. But where Tulips are raised from seed, there is an early stage in which the flowers are neither feathered nor flamed, but are of one uniform (or self-) colour. This first flowering takes place when the seedling plant is four or five years old, and its colour may be white, yellow, brown, purple, or red; it is now termed a Breeder. At some future flowering period—how many seasons later is quite uncertain—it may "break" into central markings of another colour, and these may be either flame-like or feather-like. It is now Rectified, and is placed in the Flamed or the Feathered section of its class according to the character of this variegation.

In BIZARRES the ground colour is either lemon or golden yellow, and the base of the flower is of clear yellow. Above this clear base is laid the flame or feather marks of orange, scarlet-crimson, black and brown. If the base is stained with a tinge of green, then, according to the rules, all its value as an exhibition plant is gone.

BYBLŒMENS have a clear white ground and white base, above which the variegations are similarly laid in violet, purple, black, pale lilac, lavender, and heliotrope.

ROSES also have a clear white base, and a white or rose ground above it, on which are laid flames or feathers of delicate pink, soft rose, glowing scarlet, scarlet-cerise, rose-pink, carmine-rose, or the deepest crimson.

DARWINS are really late-flowering English "Breeders," which differ from the Dutch Breeders in their numerous and striking shades of colour, ranging from the lightest to the darkest, and in their long flower-stalks.

BOURBON PALM

(LIVISTONA CHINENSIS)

Young plant

PL. 291

PARROTS or DRAGONS we have already referred to under *T. gesneriana*.

We have thought it preferable to give the foregoing clue to these classes of florists' varieties, rather than attempt a selection of the varieties themselves. With this information, the reader will be able to make the best use of the dealers' catalogues, for most of the good houses now classify their varieties under these heads.

Cultivation. Tulips succeed best in a well-drained sandy soil with which leaf-mould has been incorporated. No strong manure should be allowed to come near them; but if the ground is poor it may be improved by adding thoroughly rotted cow-manure, or the remains of an old hot-bed; but even this should be added months before Tulip-bulbs are planted. These should be put in the ground in October or the first half of November. The best way is to dig holes with the trowel, not bore them with a dibber; and these should be sufficiently deep to allow 4 inches of soil above the tip of the bulb. If the soil is not naturally of a sandy nature, it is advisable to put a little sand above and below each bulb as inserted. Where Tulips are planted in masses, the bulbs should be about 6 inches apart, otherwise they will have a crowded and less pleasing appearance when in flower.

When the leaves and stems have become quite withered, it is customary to dig up the bulbs and dry them in a shady place; afterwards placing the varieties separately in named paper bags, and storing in a thoroughly dry, cool place until the following autumn. Where Tulips have been grown in lines or definite patterns, this plan is absolutely necessary; but where they are irregularly grouped in borders, they may be safely left in the ground, if there is no danger of their being injured in digging. Where they have been used for filling beds with a view to a brilliant display, that has to be continued by means of Geraniums and other summer bedders, there is a danger of the bulbs being removed long before they are ripe, and to guard against this it is best to remove them soon after flowering, with as little disturbance of the roots as possible, and transplant them to a spare border where they can mature properly. If large quantities have to be dealt with, they should be lifted and laid in coal-ashes in a sunny place. When the leaves have withered, the bulbs may be cleaned and laid on shelves or in shallow boxes in a dry shed, where they may remain till planting-time.

Tulips make admirable pot-plants. They should be potted in a compost consisting chiefly of loam, with the addition of sand and decayed hot-bed manure. Five-inch pots should be used, and these will take

three, four, or five bulbs, according to the size of the variety potted. Their after-treatment should be the same as that recommended for Hyacinths in pots.

Tulips are increased by means of seeds, and offsets from the old bulbs. These also should be treated as suggested for the propagation of the Hyacinth. Seedling Tulips do not begin to flower until their fourth or fifth year.

Description of Plates 284 to 286.

Plate 284. *Tulipa gesneriana*, the Garden Tulip. Several forms, to show variation in colour. Fig. 1 is a section of the flower.

Plate 285. *T. gesneriana*, var. *dracontia*, the Parrot or Dragon Tulip. Fig. 1, flower after shedding the perianth.

Plate 286. *T. suaveolens*, Van Thol's, or the Sweet Tulip, in several colours, and showing the double form. Fig. 1 is the bulb, natural size.

DOG'S-TOOTH VIOLETS

Natural Order Liliaceæ. Genus *Erythronium*

Erythronium (Greek, *erythros*, red: the colour of flowers in original species). A genus of eight hardy bulbous perennials, of dwarf habit, with more or less oval, radical leaves, and solitary, nodding, rather large flowers, on a short scape. The perianth consists of six segments, which are either erect or turned back over the flower-stalk; these segments are free to the base and equal in size, but the inner three are each provided with two blunt teeth near the base. There are six stamens, and the fruit is a three-celled capsule. One species—*E. dens-canis*—is a native of Europe (whence it was introduced to England prior to 1596), and is found throughout Asia from Russia to Japan. The other species are all North American. *E. americanum* was introduced in 1665, and *E. albidum* in 1824; the others are of recent introduction.

Principal Species.

Erythronium americanum (American). Yellow Adder's-tongue. Flower scape 3 to six inches high. Leaves elliptic, lance-shaped, marked with violet and white. Flowers bright yellow, 1 inch across, the segments blunt-tipped, turned back; March and April.

E. dens-canis (dog's-tooth). Common Dog's-tooth Violet. Flower scape 6 inches high. Leaves broad-oval, blotched with purple-brown and white. Flowers 2 inches across, purplish red, rosy, lilac, or nearly white; segments acute-tipped, turned back; March and April.

COCOS WEDDELIANA

Young plant

PL. 292

E. Hendersoni (Henderson's). Flower-scape 6 to 8 inches high. Leaves oblong, spotted with purplish brown. Flowers slightly fragrant, 2 inches across, the perianth-segments turned back, pale lilac, the base spotted with dark purple; April. Introduced from Oregon.

Cultivation.

Erythroniums succeed best in a mixture of loam and peat, or light loam. The most suitable situation for them is in the rock-garden or the shrubbery borders. If planted in clumps, with the bulb about 3 inches below the surface, they may be left for several years, provided they are given an annual top-dressing of fresh soil. They are propagated by offsets.

SOME MINOR GENERA

Natural Order Liliaceæ

Calochortus (Greek *kalos*, beautiful, and *chortos*, grass: grass-like leaves). Butterfly Tulips, or Mariposa Lilies. A genus of about thirty-two species of bulbous plants (natives of North-Western America), with sword-shaped leaves, and showy flowers on scapes. The outer segments of the perianth are sepal-like and much smaller and narrower than the inner three, which are bearded on the inner surface and delicately and brightly tinted. The principal species are: *Calochortus Benthami*, rich yellow, flowering July and August; *C. cæruleus*, lilac, with dark blue lines and dots, July; *C. lilacinus*, pale pink, July; *C. luteus*, yellow, fringed with purple hairs, September; *C. Nuttallii*, pure white, with purple spot at base, June; *C. pulchellus*, bright yellow, July; *C. purpureus*, purple without, yellow within, August; *C. splendens*, purple-lilac, August; *C. venustus*, white, crimson-blotched, with yellow base, July. All these are from California, and the colours named have reference to the ample inner segments only. They should only be grown outside, in sheltered, well-drained, sunny positions, where they can be protected from wet from October to March. The most suitable soil is a compost of fibrous loam, leaf-mould, and sand in equal proportions. They are grown in pots by many cultivators, who do not care for the trouble entailed in growing them outside. They should be potted in autumn and placed in a sunny frame, giving plenty of air in dry weather at all temperatures, but keeping the lights closed during wet weather, as *excessive* moisture is the chief cause of failure. Propagated by seeds and offsets.

Hemerocallis (Greek, *hemero*, a day, and *kallos*, beauty: brief

splendour). Day Lilies. A genus of five hardy perennial herbs, natives of Temperate Europe and Asia, with bulbous rhizomes, sword-shaped, radical leaves, and showy flowers, produced in corymbs on leafless scapes. The six segments of the perianth are united at the base, and form a narrow tube in which is the free ovary. The principal species are: *Hemerocallis flava,* orange-yellow, fragrant, narrow-leaved; *H. fulva,* brownish yellow, not fragrant, broad-leaved; *H. Middendorfi,* golden yellow, broad-leaved; *H. minor,* yellow tinged with green, slightly fragrant, small, leaves very slender; *H. aurantiaca,* a recent introduction, and the largest flowered of all, the flowers being 6 inches across and of a rich orange colour. All flower through the summer, the flowers lasting but a short time, but produced abundantly and in succession. *H. flava* and *H. fulva* were in cultivation here prior to 1596, and *H. minor* was introduced about 1759. They succeed in any garden soil, and should be planted in a border where they need not be disturbed; they do well in the front of shrubberies.

Allium (the old Latin name for *A. sativum,* the Garlic). A minor genus only in the horticultural sense, for it includes about two hundred and fifty species of hardy bulbous perennials, natives of Europe, Africa, Extra-tropical Asia, and North America. The leaves are slender (flat or rounded) or lance-shaped, radical, giving forth a characteristic pungent odour when bruised. The flowers are in heads or umbels at the top of a slender scape; at first they are enclosed in a membranous spathe. The perianth-segments spread widely or assume a bell-shape. Among the principal species are: *Allium acuminatum,* deep rose, July, leaves very slender (North America, 1840); *A. cæruleum,* intense blue with dark line down each segment, July, leaves triangular (Siberia, 1830); *A. Moly,* bright yellow, May, leaves broad, lance-shaped (South Europe, 1604); *A. neapolitanum,* white, May, leaves strap-shaped (South Europe, 1823); *A. narcissiflorum,* rosy purple, bell-shaped, July, leaves lance-shaped (South-West Europe, 1817). They grow freely in most garden soils, and increase rapidly by means of offsets. No special directions are needed for their cultivation. *A. neapolitanum* is a good plant for the conservatory when grown in pots in a frame. The flowers are fragrant.

Camassia (from *Quamash,* the name used by the North American Indians, by whom the bulbs are eaten). A genus of four or five species, with grooved slender leaves, about a foot long, and blue or white flowers in a loose raceme. The perianth-segments are slightly connected at the base, and when expanded the lowest one stands rather apart from the others. They are natives of North America. The principal species are:

VEITCH'S SCREW-PINE

(PANDANUS VEITCHI)

1/9 Nat. size

PL. 293

Camassia esculenta, deep to pale blue, 2 inches across, June (North-West America, 1837); *C. Fraseri*, pale blue, smaller than the last (Eastern United States); *C. Leichtlini*, creamy white, larger than *C. esculenta*, leaves broader, May (California, 1853). Like *Alliums*, these will do well in any ordinary garden soil, if planted in a sheltered position and in partial shade, but they prefer a compost of loam, leaf-mould, and sand, with an annual top-dressing of rich soil. Propagated by seeds and offsets.

ORNITHOGALUM (Greek, *ornithos*, a bird, and *gala*, milk; significance doubtful). Star of Bethlehem. A genus of about seventy species of hardy and greenhouse bulbous perennials, natives for the most part of Europe, Asia Minor, and Africa. The leaves are slender, strap-shaped, or awl-shaped, and the somewhat small white or yellow flowers are grouped in racemes. The six segments are free to the base, where each has a honey-gland, and they spread widely. Among the chief species are: *Ornithogalum montanum*, greenish white, six to twenty in raceme, May, leaves slender (South Europe, 1824); *O. nutans*, white inside, green outside, drooping, in one-sided raceme, April (South Europe); *O. narbonense*, white, with green stripe at back of each segment, twenty to fifty in raceme, May and June, leaves slender (Mediterranean Region, 1752); *O. umbellatum*, white striped with green outside, May, leaves slender with silvery central stripe (Europe). Will grow readily in the border or wild garden. *O. nutans* and *O. umbellatum* have long been naturalised in Britain; and in gardens only need planting. *O. arabicum* and *O. thyrsoides*, both large and handsome in flower, are good greenhouse plants.

CHIONODOXA (Greek, *chion*, snow, and *doxa*, glory; in allusion to its time of flowering). Glory of the Snow. A genus of several species of hardy bulbous perennials, natives of Crete and Asia Minor, similar to *Scilla sibirica*, but differing in the more open flowers, the attachment of the stamens to the throat of the tube, and the forking of the anthers at their base. The species chiefly grown are: *Chionodoxa Lucilię*, with intense blue, white-centred flowers, an inch across, three to fifteen in a raceme, March (Asia Minor, 1877); *C. nana*, a smaller species with white or lilac flowers, ½ inch across (Crete, 1879); *C. sardensis*, dark blue with a white eye (Asia Minor, 1885). These plants are very suitable for planting in the wild garden or the rock-garden, where they can be left alone to increase. In the rock-garden they may be planted in any kind of light soil in sunny positions. They do well on sloping banks.

ASPHODELUS (Greek, *a*, not, and *sphallo*, to supplant: not to be beaten). Asphodel. A genus of five species of hardy perennials with

bunches of fleshy roots, and long, narrow, sometimes three-sided, leaves. The flowers are showy, yellow or white, in dense racemes on tall scapes. The perianth-segments are free, equal and spreading; stamens alternately long and short. They chiefly inhabit the Mediterranean Region, one extending to Himalaya. The principal species are: *Asphodelus albus*, white, May (South Europe, 1596); and *A. creticus*, yellow, July, with thread-like leaves (Crete, 1821). Planted in sandy loam of good depth, they succeed well in the shrubbery or herbaceous border. They are increased by dividing the roots in spring.

ANTHERICUM (Greek, *anthos*, a flower, and *herkos*, a hedge: in allusion to height). A genus of about fifty species of perennials, with clustered fleshy roots, slender radical leaves, and white flowers, borne in racemes or panicles on tall scapes; natives of Europe, Africa, and America. *Anthericum Liliago*, the St. Bernard's Lily, has a spreading perianth nearly 1½ inch across; leaves slender, channeled (South Europe, 1596). *A. ramosum* has smaller flowers with narrower segments, and grass-like leaves (South Europe, 1570). The St. Bruno's Lily, usually called *A. Liliastrum*, is more correctly *Paradisia Liliastrum*, constituting a genus by itself. Its flowers are more bell-shaped, 2 inches across, fragrant, and with a green spot on the tip of each white segment (South Europe, 1629). They are all summer bloomers, and are most suitable for growing in borders, or as pot-plants. The pots must be large (a foot across), and should be filled with a compost of fibrous loam, leaf-mould, and sand. From the commencement of growth until the withering of the flowers, water must be given liberally, afterwards sparingly. Propagation by seeds and division of the roots. Some of the species are stove plants.

EICHHORNIAS

Natural Order PONTEDERIACEÆ. Genus *Eichhornia*

EICHHORNIA (named in honour of J. A. F. Eichhorn, a Prussian botanist). A small genus of stove aquatics, with creeping rhizomes, roundish rhomboidal stalked leaves, and blue or violet flowers in a raceme. The flowers are funnel-shaped, the six unequal segments uniting at their base to form a tube. The stamens also are unequal, three being longer than the others. The ovary is three-celled. They are natives of South America and Tropical Africa. They are sometimes called Water **Hyacinths.**

CALADIUM BICOLOR, *vars.*

Nat. size

PL. 294

Principal Species. EICHHORNIA AZUREA (blue). Rhizome wavy, floating and rooting. Leaves variable, from round, heart-shaped to rhomboid, 3 to 8 inches across, the stalks *not* swollen. Flowers bright pale blue, hairy outside; in erect racemes; July. Native of Brazil.

E. CRASSIPES (thick-footed). Rhizome thick. Leaves roundish, fleshy; stalk much swollen near the base. Flowers violet, 1½ inch long, in a many-flowered raceme, with a spathe below; July. Native of Brazil. Also known as *Pontederia crassipes*. Plate 287.

Cultivation. *Eichhornias* should be grown in a stove tank, as they require to be in water that has a temperature of from 60° to 80°. They may be planted in large pots, and these sunk in the tank; but this is not necessary, as the stems float and root. Where potted, the soil should be of a rich character. They readily increase by means of stoloniferous growths.

Description of Plate 287. *Eichhornia crassipes*, reduced about one-third less than the natural size, showing stems, roots, leaves, spathe, and flowers.

KENTIAS

Natural Order PALMÆ. Genus *Howea*

HOWEA (named from Lord Howe's Island, the natural home of the species). A genus of several species of stove or warm greenhouse Palms, with tree-like stems attaining a height of over 30 feet, and large leaves —6 to 8 feet long—divided into numerous slender segments. The flowers are individually small, the sexes separate, but are gathered into branching spikes. The fruit is one-celled.

Species. HOWEA BELMOREANA (Belmore's). Curly Palm. Leaves with the segments taking an upward direction. Flower-spikes nodding, crowded with the flowers. Fruit oblong, over an inch long. Plate 288. Also known as *Kentia belmoreana*.

H. FORSTERIANA (Forster's). Thatch-leaf Palm. Similar to the last in all respects, except that the leaf-segments hang downwards instead of growing upwards. Also known as *Kentia forsteriana*.

Cultivation. These Palms require stove treatment throughout the greater part of the year, but may be used outside for sub-tropical gardening. They should be planted in pots or tubs, according to the size of specimens, using a compost of equal parts loam and peat, or light loam simply, with the addition of a little sand. They must have plenty of water at the roots during the summer, and frequent

syringings; the drainage must be perfect. When the pots are well-filled with roots, the plants may be kept healthy, without repotting them, by giving them liquid manure about once a week. These two Palms are the most useful and the most popular of the many species grown for decoration. If used for table decoration, they should be given as much sunlight as possible, and the leaves should be frequently sponged with clean tepid water. This is a precaution that must be taken, to ensure freshness to any Palm used in the dry air of dwelling-rooms.

Description of Plate 288. *Howea belmoreana*, the Curly Palm; young plant, greatly reduced from the natural size.

DATE PALMS

Natural Order Palmæ. Genus *Phœnix*

Phœnix (the old Greek name for the Date Palm). A genus of about a dozen species of stove or greenhouse Palms. The trunks, which are often of great height, are covered with the bases of fallen leaves. The new leaves are produced in a head at the summit of the trunk; they spread in all directions, and are more or less curved; they are pinnately divided into a very large number of slender segments, lance-shaped or sword-shaped, untoothed. Each plant bears flowers of one sex only; but the flowers are of very similar form, and consist of a three-toothed cup-shaped calyx, and three petals. The male contains from three to nine —usually six—stamens, and the female three distinct ovaries, with hooked stigmas. Only one ovary matures, developing into a one-seeded, fleshy fruit—the Date of commerce. They are natives of Tropical and Sub-tropical Asia and Africa.

History. *Phœnix dactylifera*, the Common Date Palm, has been in cultivation here ever since 1597, when it was introduced from the Levant. Great quantities of its edible fruit are imported annually, and the so-called "stones" contained therein are the seeds. As a boy, we have often raised young plants from seeds so obtained, and sown outside in a sunny border; but trusting too much to the hardiness of plants so raised, have lost them early. In the South of France large numbers of *Phœnix* are raised out of doors from seed, afterwards potted and grown on in a gentle hot-bed. *P. sylvestris*, one of the hardiest of the genus, was introduced from India in 1763; *P. reclinata*, from South-East Africa, in 1792; *P. acaulis*, from Central India, 1816; *P. spinosa*, from Western Tropical Africa, in 1823; and *P. rupicola*, from India, in

TRUMPET- OR ARUM-LILY

(RICHARDIA AFRICANA)

Nat. size

PL. 295

1873. *P. canariensis* (syn. *P. tenuis*), introduced about twenty years ago from the Canary Islands, is now abundantly planted in gardens and streets in South Europe and California.

Principal Species.

PHŒNIX ACAULIS (stemless). Stem short, thick, bulb-like. Leaves 1 to 3 feet long, the lower pinnæ reduced to broad, flat spines.

P. DACTYLIFERA (Date-bearing). Trunk 50 feet or more high, but rarely exceeding 30 feet in this country. Leaves greyish, 12 feet or more long. Flowers white; male panicles fragrant, 6 to 9 inches long, female spikes 1 to 2 feet long.

P. RECLINATA (leaning). Stem about 20 to 50 feet high; old specimens stout. Leaves with somewhat triangular segments, spreading.

P. RUPICOLA (rock-loving). Stem about 15 feet high. Leaf-stalk dilated at base; leaf arching and spreading, the pinnæ slender, 6 inches long, lower ones spine-like.

P. SPINOSA (spiny). Trunk from 6 to 30 feet high. Pinnæ of leaves narrow, lance-shaped, finely tapering to a long, sharp point, some scattered, some clustered; those near the base of the midrib are shorter, rough, and more like spines.

P. SYLVESTRIS (of woods). East Indian Wine Palm. Stem 40 feet high. Leaves grey-green, 7 to 12 feet long; pinnæ opposite or alternate, 6 to 18 inches long; leaf-stalk brown.

Cultivation.

The directions given for the cultivation of the Curly Palm apply equally to this genus and some others. They are raised from seed sown in sandy soil, and the pots plunged in a hot-bed of medium temperature. The seedlings are potted separately in small pots of sandy loam, or loam and leaf-mould; but in successive shifts turfy loam and peat, to which a little sand has been added, should be used.

Description of Plate 289.

Phœnix spinosa, the Spiny Date Palm. Young plant greatly reduced in size.

CHAMÆROPS PALMS

Natural Order PALMÆ. Genus *Chamærops*

CHAMÆROPS (Greek, *chamai*, on the ground, and *rhops*, a bush: in allusion to their dwarf, bush-like habit). A genus of two species of greenhouse Palms, with fan-shaped leaves and prickly leaf-stalks. The flowers are either unisexual or bisexual, panicled, and produced from the axils of the leaves. They consist of similar parts as in those of *Phœnix*. The

fruits are one-seeded berries the size of olives. *C. humilis* is a native of South Europe and North Africa, and was introduced in 1731; *C. macrocarpa* is confined to North Africa.

Species.

CHAMÆROPS HUMILIS (dwarf). Stem usually 4 to 6 feet in Britain, but attaining a height of 20 feet in its native habitat. Leaves glaucous, on spiny-edged stalks; the margins of the blade slit into a number of slender, erect segments. The only European representative of the Palmæ.

C. MACROCARPA (large-fruited). Similar to the last, but more robust in all respects, more hardy, and with larger fruits.

Other species known as *Chamærops* are now referred to *Trachycarpus*.

Cultivation.

These Palms like a rather stronger soil than *Howea*, and the potting compost should consist chiefly of rich loam, with the addition of a little leaf-mould or peat, and sand. Good drainage is equally essential, as the plants require abundant water throughout the summer. They require to be grown in the greenhouse, but in summer they may be planted out in protected situations. In addition to raising them from seeds, they may be readily propagated by means of the suckers which they produce.

TRACHYCARPUS PALMS

Natural Order PALMÆ. Genus *Trachycarpus*

TRACHYCARPUS (Greek, *trachys*, rough, and *carpos*, fruit). A genus of three species of greenhouse Palms formerly included in *Chamærops*. They have tall, solitary stems, or dwarf and tufted ones. The leaves are terminal, more round in general outline; there is no midrib, and the leaf-stalks are free from spines. The flowers are small and yellowish, with thick leathery spathes; the fruit is small, yellowish, more or less globular; one-seeded. The species are natives of North India, Burmah, China, and Japan.

History.

These Palms are of recent introduction, *Trachycarpus excelsa* (*Fortunei*), the longest known, having been introduced from China and Japan only in 1844, and *T. martiana*, from Himalaya, being of still more recent date. *T. excelsa* is quite hardy in the South of England. The coarse brown fibre obtained from the decaying bases of the old leaves is turned to good account in China for a variety of purposes—such as making hats, mats, brushes, ropes, and the wet-weather dress (So-e) of the agricultural labourer. On this account it is often called the Hemp Palm.

FLAMINGO FLOWER

(ANTHURIUM SCHERZERIANUM)

$^{2}/_{3}$ Nat. size

PL. 296

Principal Species.

TRACHYCARPUS EXCELSA (tall). Trunk 8 to 24 feet high. Leaves in young specimens oblong; in older ones more orbicular, 1½ foot across, split up into a multitude of segments which are spread out like fingers (*digitate*), and usually with two teeth at the tips. The leaf-stalks are 2 to 3 feet long, finely toothed along the margins. Plate 290. Also known as *Chamærops excelsa* and *C. Fortunei.*

T. MARTIANA (Martius'). Trunk 9 feet high, about 5 inches thick. Leaves fan-shaped, general outline kidney-shaped, 3½ feet wide and 2 feet long, divided into many narrow segments; the side segments shorter than the others, but more completely divided; leaf-stalk 1½ foot long, the margins finely but irregularly toothed. Also known as *T. khasyana.*

Cultivation.

Trachycarpus excelsa will resist as much as ten degrees of frost, and is the hardiest known Palm. In those Southern localities where low readings of the thermometer occasionally occur in winter, it should be protected—if planted out—by means of mats, fern, or straw, bound round the trunk. The soil should be a strong, rich loam, to which a little leaf-mould and sand have been added. It should otherwise be treated the same as directed for *Chamærops.* For pot-culture, young specimens are best.

Description of Plate 290.

Trachycarpus excelsa, a young plant, considerably reduced in size. The footline is printed excels*us* in error.

LIVISTONA PALMS

Natural Order PALMÆ. Genus *Livistona*

LIVISTONA (named as a roundabout kind of honour to P. Murray of Livingstone, near Edinburgh). A genus of about fourteen species, chiefly stove Palms, with terminal fan-shaped leaves divided into numerous segments, split at the apex, and frequently having threads between them. The bases of the leaf-stalks are buried in a mass of fibrous network. The flowers are three-parted, containing both male and female organs (*complete*), and attached to branching spikes with several leathery spathes. The species are natives of Eastern Tropical Asia, the Malay Archipelago, New Guinea, and Eastern Australia.

History.

These Palms are very useful to the natives of the countries in which they grow. The leaves are commonly used in the manufacture of fans, hats, umbrellas, thatch, etc. *Livistona*

chinensis (also known as *L. mauritiana* and *Latania borbonica*) was introduced from Southern China in 1818; it is sufficiently hardy to endure the winter out of doors in South Cornwall, where it attains a good height. *L. australis*, from Eastern Australia, and *L. humilis*, from Tropical Australia, were both introduced in 1824. The leaves of *L. jenkinsiana*, introduced from Assam in 1845, furnish the material for the umbrella-like hats worn by the Assamese. *L. Hoogendorpii* was introduced from the Indian Archipelago in 1874.

Principal Species.

LIVISTONA AUSTRALIS (southern). Trunk 80 feet high, swollen at the base. Leaves dark green, with metallic lustre, nearly round, plaited, divided at the margin into numerous narrow, plaited segments; leaf-stalks stout, dark brown, armed with black spines throughout their length.

L. CHINENSIS (Chinese). Bourbon Palm. Trunk 50 feet high. Leaves pale green, nearly circular, fan-shaped, 5 feet across, plaited; margins divided into numerous segments, which hang down; leaf-stalks 4 or 5 feet long, rounded beneath, flat above, the edges armed with stout spines. Plate 291 (young specimen).

L. HUMILIS (lowly). Trunk 6 to 30 feet high. Leaves nearly round, somewhat heart-shaped, plaited; the margins deeply divided into slender, drooping segments; leaf-stalks with numerous spiny edges.

L. JENKINSIANA (Jenkins'). Trunk 10 feet high. Leaves fan-shaped, plaited, 2 to 4 feet across; margins divided into rather broad segments; leaf-stalks 2 to 10 feet long, flat above, slightly keeled beneath, the edges armed with slightly recurved stout spines.

Cultivation.

Loam, with a little sand added, is the most suitable compost for these Palms. The species named make handsome pot-plants when young, and in favourable situations the older specimens may be planted out, giving them winter protection where necessary. Where the thermometer has too low a range to permit of their being permanently planted out, they may at least be used for sub-tropical effects during the hotter months of the year. In potting them, have due regard for efficient drainage, and in summer see that they never want for water, which must be given liberally. They are propagated by means of imported seeds, which should be sown in sandy soil, and germinated on a hot-bed or in a stove.

Description of Plate 291.

Livistona chinensis, the Bourbon Palm. A young specimen in which the leaves have not yet attained the form usual in adults; young specimens are most frequently grown for table decoration.

CAPE POND-WEED

(APONOGETON DISTACHYUM)

Nat. size

PL. 297

COCOS PALMS

Natural Order PALMÆ. Genus *Cocos*

Cocos (Portuguese, *coco*, monkey: in allusion to the end of the nut of *C. nucifera* resembling a monkey's face). A genus of beautiful stove Palms, with plume-like leaves and trunks of considerable height. The flowers are similar to those of the genera already described, but the sexes are separate and borne on different trees. The fruit is either egg-shaped or elliptical, consisting of a bony shell wrapped in a very thick fibrous husk, and containing a single seed. The cocoanut is a familiar example. They are natives of the Tropical Regions of America: one, however, *C. nucifera*, being found in Asia and Africa.

History. *Cocos nucifera*, the Cocoanut Palm, was introduced to England in 1690 from the East Indies. Although growing freely along the coasts of most tropical countries, its native home is not known; but it is believed to have spread originally from the West coast of Central America. It does not succeed in this country so well as several other species of the genus. It is probably the most generally useful of all plants, and supplies the natives of some of the countries where it grows with almost all they require. It is said to have as many uses as there are days in the year. *C. plumosa*, a Brazilian species, was introduced in 1825. *C. schizophylla*, also from Brazil, dates from 1846. *C. weddeliana*, a South American species, is of more recent introduction, and is one of the most graceful of all Palms. The Cocoanut was fruited in the gardens of the Duke of Northumberland at Syon, Brentford, about forty years ago.

Principal Species. COCOS PLUMOSA (feathery). Stem stout and column-like, 40 to 50 feet high. Leaves, like enormous ostrich plumes, from 3 to 15 feet long, pinnate, the pinnæ clustered, about an inch broad and 1 to 2 feet long, glaucous beneath. Flowers waxy-looking, in large drooping clusters.

C. ROMANZOFFIANA (Romanzoff's). Leaves long, gracefully curved, with long, drooping pinnæ. Native of Brazil.

C. SCHIZOPHYLLA (cut-leaved). Trunk 8 feet high. Leaves spreading, arched, 6 feet long; pinnæ 2 feet long with a broad terminal lobe; leaf-stalk with red spines along the red margins.

C. WEDDELIANA (Weddel's). Trunk slender, clothed with black, netted fibres. Leaves 1 to 4 feet long, elegant and arching gracefully; pinnæ long and slender; dark above, glaucous beneath. Plate 292;

young specimen, Also known as *Leopoldinia pulchra* and *Glaziova elegantissima.*

Cultivation. These Palms are not so nearly hardy as previously described genera, and therefore not so suited for placing outside in summer. In this country their place is more distinctly in the stove. A mixture of loam and peat should be used for *C. weddeliana*; the others thrive in loam and sand. Good drainage, and abundant water in summer, to be gradually reduced as winter approaches, is again the rule. They are in great request for the decoration of dwelling-rooms and the dinner-table, but where so employed they should be frequently changed, so that an early return to the stove will enable them to keep fresh and healthy.

Description of Plate 292. *Cocos weddeliana,* Weddel's Palm; a young specimen. The great Palm order comprises about one hundred and thirty genera and eleven hundred species, chiefly tropical. Many of them are in cultivation in European gardens, about four hundred species being represented at Kew. They are usually trees with erect, unbranched trunks, bearing heads of leaves which are either palmate, plumose, or simple. Only a few of the best known genera could be mentioned here, although the value of many of the Palms for decorative gardening has resulted in their increased popularity.

SCREW PINES

Natural Order PANDANEÆ. Genus *Pandanus*

PANDANUS (derived from *Pandang*, the Malayan name of these plants). A genus of about eighty species of stove plants, chiefly trees and shrubs, and a few herbs. Trunk unbranched, forking, or with spreading branches. Leaves long and slender, sword-shaped, leathery, sheathing at the base; the edges and midrib armed with innumerable sharp, curved prickles. These leaves are arranged in three spiral series towards the ends of the branches, forming dense tufts or crowns. The male and female flowers are on different plants (*diœcious*): the males on a clustered, branched spadix, the females on a simple one. Fruit globular, oblong, or cylindrical. The headquarters of the genus are in the islands of the Malay Archipelago, the Mascarenes, and the Seychelles, whilst a few species are scattered over Asia, Africa, Tropical Australia, Oceania, and the West Indies.

History. The Screw Pines are so called not because they have either relationship or resemblance to the true Pines (*Pinus*,

CYPERUS ALTERNIFOLIUS

Nat. size

PL. 298

etc.), but because the spiny leaves somewhat resemble those of the Pine-Apple (*Ananassa*), and because of their large pine-apple-like fruits. The prefix Screw has reference to the spiral arrangement of the leaves on the stem. A very singular effect is caused by their production of adventitious roots from various parts of the trunk, which seek the earth and become stout and stem-like; the trunk thus appears to have several props to keep it from falling. *Pandanus odoratissimus*, whose male flowers yield a fragrance which Dr. Roxburgh declared was the richest and most powerful perfume that he knew, was introduced from the East Indies in 1771. Most of the species in cultivation in British stoves are of recent introduction. Among them we may mention: *P. Candelabrum*, from Guinea in 1826; *P. glaucescens*, from India in 1865; *P. heterocarpus*, from the Philippines, 1866; *P. Houlletii*, from Singapore, 1868; *P. Veitchii*, from Polynesia, 1868; *P. conoideus*, from New Caledonia, 1872; *P. minor*, from Bengal, 1878; *P. Pancheri*, from New Caledonia, 1878; etc.

Principal Species.

PANDANUS CANDELABRUM. Chandelier Tree. Trunk 30 feet high, sending down numerous branch-like roots, which give the tree a certain resemblance to a chandelier. Leaves dark green, 3 feet long and 2 inches wide; edges armed with brown spines. The var. *variegatus* is striped with white from base to tip, and the spines are white. Java, 1875. This is more in request than the type.

P. CONOIDEUS (somewhat conical). Trunk branching freely, about 14 feet high. Leaves tufted, long, arching, dark green, with smooth keel and spiny margins and ridges.

P. GLAUCESCENS (somewhat glaucous). Plant herbaceous. Leaves dense, spreading, terminating in a long point; glaucous, edges armed with white spines.

P. HETEROCARPUS (differing fruit). Leaves broad, 3 to 6 feet long, dark and shining above, somewhat glaucous beneath; midrib beneath, and margins armed with short white spines.

P. HOULLETII (Houllet's). Leaves two-ranked, greenish red above, coppery beneath; 4 to 5 feet long and 3 inches wide, with spiny margin and keel, and ending in a very long, slender point.

P. MINOR (lesser). Stem slender, about 3 feet long, but more or less prostrate. Leaves inclined to become two-ranked, $1\frac{1}{2}$ to 2 feet long, keeled, and with spiny margins.

P. ODORATISSIMA (most fragrant). Stem slender, 20 feet high. Leaves bright green, 3 to 5 feet long, edges armed with short white spines; in drooping tufts at the ends of the short branches.

P. PANCHERI (Pancher's). Leaves 3 to 5 feet long and 2 inches wide;

keeled; margins spiny-toothed; lower part of keel reddish and strongly spiny-toothed.

P. UTILIS (useful). Stem branched, 60 feet high. Leaves glaucous, 1 to 3 feet long, armed with sharp red spines; more or less erect. In gardens this is often called *P. odoratissimus*, but wrongly.

P. VANDERMEESCHII (Vandermeesch's). Stem light-coloured, 20 feet high, 5 or 6 inches thick. Leaves glaucous, stiff, erect, 2 to 3 feet long, nearly 2 inches broad, with prominent, spiny, red midrib, and thick, red, spiny margins.

P. VEITCHI (Veitch's). Leaves about 2 feet long, arching and bending over when full grown; longitudinally striped with pure white and deep bright green; edges armed with soft spiny teeth. Plate 293.

Cultivation. The chief requirement in growing Screw Pines is the stove temperature: given that, their cultivation is simple enough. They prefer a compost of about two parts sandy loam with one part leaf-mould, to which should be added a little charcoal. The pots must be well-drained, for the plants require much water during the summer; but in winter they must be kept fairly dry, and not watered overhead. The pots used should be large, for the roots always go straight down, and this has the effect of forcing the plant up out of the pot if small sizes are used. They are propagated from seeds, but chiefly from the suckers and offsets that grow round the base. These should be detached with a sharp knife, separately potted, and kept almost dry in a close propagating frame until well-rooted. These young plants so obtained make the most ornamental subjects for decorative purposes.

Description of Plate 293. *Pandanus Veitchi*, Veitch's Screw Pine, one-half the natural size.

CALADIUMS

Natural Order AROIDEÆ. Genus *Caladium*

CALADIUM (the meaning of this word has not been explained by its author, Ventenat). A genus of stove perennials, allied to the *Arum*, and chiefly remarkable for their ornamental foliage. They have tuberous rootstocks rich in starch, on which account several species are cultivated in the Tropics to be used as food. The leaves are borne upon long footstalks, and are somewhat oval, more or less arrow-head-shaped, and often strikingly and richly coloured. The flowers are borne upon a stout spadix, which is partly covered by a hood-like spathe. The upper part

SCIRPUS RIPARIUS

Nat. size

PL. 299

of the spadix is entirely covered with stamens, whose anthers are shield-shaped; the lower part bears the two-celled ovaries, and the intermediate portion is covered by blunt glands or sterile stamens. They are natives of Tropical America.

History. Several *Caladiums* were introduced during the eighteenth century, but they are not now to be found in cultivation in this country. Very few species, indeed, of any sort are now grown, their place being taken by the more beautiful hybrids, of which there are so many, the list receiving additions every year. These are principally the progeny of *C. bicolor* crossed with other species. *C. bicolor* was introduced from Brazil in 1773; *C. maculatum*, from "South America" in 1820; *C. argyrites* and *C. Chantini*, from Para in 1858. *C. devosianum*, *C. Hardii*, *C. Kochii*, *C. macrophyllum*, and *C. rubro-venium* were all introduced from Para in the same year—1862—whence also came *C. Cannartii*, 1863; *C. Leopoldi*, 1864; *C. Rongieri*, 1864; and *C. Wallisii*, 1864.

Principal Species. CALADIUM ARGYRITES (silvery). One of the smallest of the genus. Leaves 4 inches long; ground colour light green, irregularly blotched with white, the centre and margins white. Also known as *C. Humboldtii*.

C. BICOLOR (two-coloured). Leaves 1½ foot long, green, blotched with white.

C. CHANTINI (Chantin's). Leaves bright crimson, blotched with white and margined with dark green.

C. DEVOSIANUM (Devosie's). Leaves green, blotched with white and pink.

C. KOCHII (Koch's). Leaves green, spotted with white.

C. LEOPOLDI (Prince Leopold's). Leaves green, marbled with red and pink.

C. MACROPHYLLUM (large-leaved). Leaves large, pale green, blotched with greenish white.

C. MACULATUM (spotted). Leaves green, spotted with white.

C. RUBRO-VENIUM (red-veined). Leaves green, greyish towards centre, veins red.

C. SANGUINOLENTUM (bloody). Leaves with white midrib, blotched with red.

C. VERSCHAFFELTII (Verschaffelt's). Leaves bright green, spotted with bright red.

C. WALLISII (Wallis'). Leaves dark olive, with yellowish white veins, and spotted and blotched with white.

Cultivation. In the exceedingly numerous hybrid varieties all the

above-named marblings and blotches will be found repeated with greater richness of colour and brilliance, the best points of each species being intensified. In some the green has almost disappeared, and every shade of red, pink, violet, and yellow is produced in irregular blotches, small spots, marbling, and sometimes in lines and stripes parallel with the veins. *Caladiums* must be kept in the humid atmosphere of the stove until the leaves are fully developed; their foliage is of such a texture that it will not long endure the dry air of living rooms. They succeed best in a compost of loam, well-rotted manure, sand, and leaf-mould in equal parts, with a little powdered charcoal added. Good drainage must be ensured. In February, the tubers should be shaken out of the old soil, carefully cleaned, and any offsets removed for purposes of propagation. They should be planted singly in small pots of light sandy soil, and plunged in a hot-bed with a temperature of about 80°, watering them liberally. When they have developed one or two leaves, they should be potted into larger pots, or, if large specimens are not required, several may be planted together in the same pot. They must be kept in a hot, moist stove, and shaded from bright sunshine. When the leaves fade, the pots should be placed under a stage in a stove, but water must be given now and then, as *Caladiums* are all swamp plants, and generally suffer if kept dry.

Description of Plate 294. *Caladium bicolor*, varieties of leaf coloration, together with the spathe. Fig. 1 is a section through the spathe, showing the spadix; 2 is a male flower, and 3 a female enlarged.

ARUM LILIES

Natural Order AROIDEÆ. Genus *Richardia.*

RICHARDIA (named in honour of L. C. Richard, a French botanist, who lived 1754–1821). A genus of seven species of greenhouse or stove perennials with *Caladium*-like rhizomes, and arrow-shaped or halbert-shaped leaves on long, stout stalks, which are sheathing at the base. The flowers are borne upon a long, thick spadix, the upper part of which is covered with the yellow anthers; the pitcher-shaped ovaries cluster round the lower end, and each one is surrounded by barren stamens. The whole of this column of flowers is closed round by the pure white spathe, which is flattened and bent backwards above. The fruits are one-celled, few-seeded berries. The species are natives of South Africa: **their habitat, marshes and river-sides.**

FEATHER GRASSES

(*A*) STIPA PENNATA — (*B*) PENNISETUM LONGISTYLUM

Nat. size

PL. 300

History. *Richardia africana* was introduced from the Cape of Good Hope in the year 1731, under the name of *Calla æthiopica*, under which name it is still known in many gardens and in trade lists, though it has long been removed from the genus *Calla*. Two other species—*R. albo-maculata* and *R. hastata*—were introduced in 1859, and ten years later a fourth—*R. melanoleuca*. Within the last seven years three new species have been introduced, viz.; *R. elliotiana*, *R. Pentlandii*, and *R. Rehmanni*; the two first are the popular yellow *Callas*, and the third is the rose-coloured *Calla*. *R. africana* is the species most widely grown, though *R. albo-maculata* and *R. hastata* are also coming into favour.

Principal Species. RICHARDIA AFRICANA (African). Lily of the Nile; Arum Lily; Trumpet Lily. Leaves arrow-shaped, bright green, without spots. Spathe white, rolled round below, but fully expanded and curved back above. Spadix bright yellow, entirely covered with flowers; spring and summer; 2 feet high. Plate 295. There is a large-flowered variety called *grandiflora*, and a form much smaller than the type in all its parts, called *Little Gem*.

R. ALBO-MACULATA (white-spotted). Leaves more elongate than in *R. africana*, on shorter stalks, and with translucent white blotches, which run parallel with the veins. Spathe greenish white, less open above than in *R. africana*; about 2 feet high; summer.

R. ELLIOTIANA (Elliot's). Tuber potato-like; leaves large, spear-shaped, green with silvery blotches; spathes nearly as large as those of *R. africana*, but urn-shaped, and coloured a rich canary yellow; spring. Requires stove treatment.

R. HASTATA (halberd-shaped). Leaves similar to those of *R. africana*. Spathe greenish yellow, with a somewhat bell-shaped tube and long, pointed blade; summer.

R. PENTLANDII (Pentland's). Tuber potato-like; leaves large, spear-shaped, deep green, the petioles tinged with purple; spathes like those of *R. africana*, but coloured a rich canary yellow, with a purple stain about the base of the spadix; spring. Requires stove treatment.

R. REHMANNI (Rehmann's). A small species with erect, lance-shaped leaves, mottled with grey. Spathes small, in Natal said to be rose-coloured; in England they are white, with a rosy tinge; spring. Greenhouse.

Cultivation. *Richardias* delight in a rich soil with plenty of moisture. They are very easy to manage, and, except the two tropical species, require but slight protection where serious frosts are not the rule. In Cornwall they are commonly grown outside throughout the year;

but where the thermometer is apt to fall far below 32° they should be housed before winter comes on. It is not easy to make the soil too rich for these plants, but equal parts of cow-manure and good loam will be found to suit them admirably. A little warmth early in the year will cause them to start growth sooner than in the ordinary course, and this may be easily maintained, and will give earlier flowers. After flowering, the plants should be turned outside, into a specially prepared bed that has been heavily manured. Give water freely during the summer, and thus allow the plants to feed and ripen; potting them again early in October, and replacing them in the cool greenhouse, where they should have a position fully exposed to the light. In repotting them, the offsets may be separated, if it is desired to increase the stock; but we think a large clump, well surrounded by leaves of all sizes, is more desirable than the single-stemmed specimens so common. When a clump has attained to large proportions, it has a very handsome appearance, and will furnish a number of offsets from its circumference every year. Slugs are sometimes very attentive to *Richardias*, and must be hunted out; they attack the tender, rolled-up young leaves, and entirely spoil them. *R. africana* succeeds when planted in shallow water by the side of a lake or stream. *R. Pentlandii* and *R. elliotiana* should be grown in a warm house at all times.

Description of Plate 295. *Richardia africana*, the Arum Lily or Trumpet Lily; leaves and flowers, natural size, but the leaves are young ones. The white trumpet is the spathe, the yellow column the spadix, shown separately and enlarged in Fig. 1, the upper and yellow portion covered with anthers. One of these, enlarged, is shown in Fig. 2, whilst one of the green ovaries from the base is figured separately at 3.

FLAMINGO FLOWERS

Natural Order AROIDEÆ. Genus *Anthurium*

ANTHURIUM (Greek, *anthos*, a flower, and *oura*, a tail: in allusion to the form of the spadix). A genus containing about a hundred and sixty species of stove and greenhouse perennials, which differ from *Richardia* in the fully expanding spathe, and the perfect character of the flowers that densely crowd the spadix. These consist of a four-parted perianth, four stamens, and a two-celled ovary. The leaves are variable in form in different species: some entire, others with finger-like divisions: in some species, too, the leaf-stalks are swollen. The plants often grow as

epiphytes in the forks of trees, or clinging to the trunks. They are all natives of Tropical America.

History. *Anthuriums* are a distinctly modern class of cultivated plants, most of the species to be seen in our planthouses having been introduced within the last forty years. *Anthurium Hookeri* was imported from Tropical America as far back as 1840, and *A. acaule*, from the West Indies, in 1853. But these may now be regarded as old-fashioned representatives of the genus. *A. subsignatum* was introduced in 1861 from Costa Rica, whence also came the splendid *A. scherzerianum* depicted in our plate. In 1866 were introduced *A. lindenianum* from Columbia, and *A. regale* from Peru. *A. ornatum*, from Venezuela, came in 1869, and *A. Bakeri*, from Costa Rica, in 1872. Up to this period *A. scherzerianum* had kept the premier position in the genus for showiness, but in 1876 *A. andreanum*, discovered by Dr. José Triana, a native of Columbia, as far back as 1853, was introduced by M. André into Europe. So like are the turned-back spathe and the curved spadix to the back and neck of a brilliant-hued bird, that M. André thought he was looking at a bird of the genus *Loxia*, when he came across the first plant. In one point this species does not excel *A. scherzerianum*: it does not flower so freely. Other species have since been introduced, such as *A. Walujewi*, from Venezuela in 1880; *A. insigne*, from Columbia in 1881; *A. splendidum* in 1882. In addition, a great number of varieties and hybrids have been produced within the last dozen years, and not a few of these are the partial offspring of *A. andreanum*

Principal Species. ANTHURIUM ANDREANUM (André's). Leaves bright green, spear-shaped. Spathe heart-shaped, leathery, corrugated, orange-red; 3 to 9 inches long. Spadix yellow, with central band of white; 3 inches long.

A. LINDENIANUM (Linden's). Leaves roundish-heart-shaped. Spathe white, not curved back, as usual, but the tip thrown forward to slightly protect the white or purplish spadix; fragrant; October.

A. SCHERZERIANUM (Scherzer's). Leaves oblong-lance-shaped, 12 to 18 inches long; leathery, evergreen. Spathe oval-oblong, 3 to 6 inches long, brilliant scarlet. Spadix curled, scarlet or orange. The flowers, with their long scarlet stalks, are in certain aspects strongly suggestive of Flamingoes resting upon one leg, and this has given rise to their popular name. Plate 296. There are several varieties in cultivation.

A. SPLENDIDUM (splendid). Leaves heart-shaped, the nerves margined by a band of dark velvety green on each side, whilst the intervening spaces are of a pale yellowish green, and blistered.

A. Walujewi (Walujew's). Leaves broad, heart-shaped, 12 or 14 inches long, bright reddish crimson when young, afterwards changing to a metallic olive-green.

A. grande, *A. magnificum*, *A. warocqueanum*, and *A. Veitchii* are magnificent foliage plants. There is a large collection of species of *Anthurium* at Kew.

Cultivation. *Anthuriums* require stove treatment, though very high temperatures are unnecessary; what would be called medium stove heat—between 60° and 70°—will suit them, combined with a humid atmosphere. The best soil in which to pot them is a miscellaneous mixture of lumps of fibrous peat, sphagnum moss, turfy loam, silver sand, charcoal, and a few broken crocks. These should be associated in the following proportions: peat 4, sphagnum 1, loam 2, silver sand ½. To these the charcoal and crocks should be added in small quantity, as a kind of seasoning. The drainage should be of the best, and the plant should be so inserted that its crown stands on a cone of earth about 3 inches above the rim of the pot. Give plenty of water at the roots, and frequently syringe. Propagation is most readily effected by pulling the crowns carefully apart in January, and separately potting them. Hybrids are, of course, raised from seed, but it is a long and tedious process.

Description of Plate 296. *Anthurium scherzerianum*, the Flamingo Flower. Plant and leaves greatly reduced; flowers reduced one-third. Fig. 1 is a flower separated from the spadix; 2, a section of the same; 3, a single stamen.

CAPE POND-WEED

Natural Order Naiadaceæ. Genus *Aponogeton*

Aponogeton (said to be Celtic, *apon*, water, and *geiton*, neighbour: in allusion to the habitat). A genus of about twenty species of stove, greenhouse, or hardy aquatic herbs, with tuberous roots, oblong or very narrow, erect or floating leaves. The flowers are borne in spikes, solitary or twin, on a stout scape; the most conspicuous part of the inflorescence being a double row of large white, pink, or violet bracts, at the base of which are the true flowers. These are quite without calyx or corolla, and consist of from six to eighteen stamens surrounding from four to six distinct carpels, each with its short curved style and simple stigma. At first the entire inflorescence is enclosed in a tapering spathe,

RIBBON GRASS

(PHALARIS ARUNDINACEA, *var. variegata*)

Nat. size

PL. 301

which is forced off as the bracts develop. After the fertilisation of the flowers, the bracts assume a deep green tint, grow large, and look like tufts of leaves, among which the large, beaked carpels will be found. Each contains about four seeds. The species are natives of Tropical and Temperate Asia, Africa, and Australia.

Principal Species. APONOGETON DISTACHYUM (two-spiked). The Cape Pond-Weed or Water Hawthorn. Leaves oblong, lance-shaped, long-stalked, floating. Flowers fragrant, like Hawthorn; spikes forked; bracts white, oval; anthers purplish. Hardy. Introduced from the Cape of Good Hope, 1788. Plate 297. There is a var. *roseum* in which the bracts are rosy-tinted.

Cultivation. In some parts of the country this beautiful pond-weed has been naturalised in lakes and large ponds. Cultivation is a very simple affair with it. All that is necessary is to give it a good start until it can get its roots well into the bed of the pond—that is, if it is to be grown in a pond. For a small tank or aquarium, it should be potted in a compost of sandy loam and rotted cow-manure, well mixed, and the whole carefully sunk. If desired to naturalise it in a larger piece of water, the plant should first be grown in a tank until quite established, then repotted with the compost mentioned, and sunk into the mud, with a clear foot of water above the rim of the pot. Before immersing the pot, crack it, so that the growth of the roots may burst it open and allow them free exit to the surrounding soil. After this is effected the plant will rapidly increase, and the ripe seeds fall to the bottom and germinate.

Description of Plate 297. *Aponogeton distachyum*, the Cape Pond-Weed. Leaves, flowers, and rhizome, natural size. The lower leaf has the two edges rolled inwards, the usual condition when immature. Fig. 1 is a separated bract, with its stamens and carpels; 2 is the same after fertilisation of the carpels and falling off of the stamens; 3 is a single seed; 4, a vertical section of a fruit, showing a seed within; 5, a transverse section of the same, showing two seeds cut through.

CYPERUSES

Natural Order CYPERACEÆ. Genus *Cyperus*

CYPERUS (the old Greek name for these plants). A genus of about seven hundred species of Rush-like or Grass-like perennial (rarely annual) herbs, with three-sided, jointless, solid stems. Leaves with basal sheaths,

which are not split, as in the Grasses. The flowers are somewhat similar to those of the Grasses. They are arranged in compressed spikelets which are in turn grouped in heads, umbels, or panicles. The flowers proper are found in the axils of keeled, concave bracts (*glumes*), of which there are always two rows in the spikelet. The perianth is represented in this Order by a few minute scales or bristles, or may be entirely absent, which latter is the case in this genus. There are one, two, or three stamens, a one-celled ovary with two or three stigmas, which develops into a three-sided nut. The species—of which two occur, though rarely, in Britain—are distributed over all the warmer parts of the earth.

History. Few of the species of *Cyperus* have any interest for horticulturists, though in various other ways the genus has value. The succulent roots yield a mucilage which has been used medicinally, and that of *Cyperus longus*, or Galingale, one of the British species, is said to have tonic properties. Others, such as the *C. esculentus* of Southern Europe, yield tubers which are roasted and eaten; *C. alternifolius* was introduced from Madagascar in 1781; *C. Papyrus*, the Egyptian Paper Reed, was introduced from Egypt in 1803. This is the plant whose pith was used to make the earliest form of paper—papyrus—which was made in a very simple manner by cutting the pith in slices and laying a number of them with their edges touching, another layer was laid upon these, crossing them, and the whole subjected to pressure, which united it into a compact sheet.

Principal Species. CYPERUS ALTERNIFOLIUS (alternate-leaved). Stems numerous, erect, dark green, 1 foot to 2½ feet high. The leaves are very long and narrow, their sheaths one in another round the stem, the blades falling back gracefully from the summit of the stem in all directions. Perennial. Plate 298. The var. *variegatus* has the leaves and stems striped with white, or entirely white.

C. LONGUS (long). Galingale. Stem solitary, stiff, and erect, 2 to 3 feet high. Leaves few, flat, keeled, from the lower part of the stem only. Flowers in a loose umbellate-cyme; bracts leaf-like; glumes erect, red-brown, with a green midrib; autumn. Perennial.

C. PAPYRUS (paper). Paper Reed. Stem 10 to 15 feet high, stout, surmounted by a huge compound umbel of rays and bracts, the lower series of which fall back and present a very graceful appearance. Also known as *Papyrus antiquorum*. Perennial.

Cultivation. These plants are easily grown, and the two first described above are useful for conservatory decoration. They should be potted in a compost of loam and sand to which a little peat has

(*A*) QUAKING GRASS (BRIZA MAXIMA)
(*B*) HARE'S-TAIL-GRASS (LAGURUS OVATUS)
(*C*) HAIR GRASS (AIRA PULCHELLA)

Nat. size

PL. 302

been added. They grow naturally in marshy places and on the margins of rivers; they consequently require plenty of water in cultivation. *C. alternifolius* will do well as an indoor window plant, and is very effective for table decoration. *C. longus* would succeed better planted out on the margin of lake or stream. *C. Papyrus* should be grown in a large pot filled with rich loam; the pot then stood in a tub that is ever filled with water. Where there is a conservatory tank for the growth of aquatics, the pot should be plunged beneath the water. Or the Papyrus may be planted in a basket of heavy loam, and about the end of May this can be immersed in any piece of ornamental water outside where it will get plenty of sunshine. Sometime in September or early in October, according to the season, it should be removed indoors and kept free from frost, but not dry. *C. Papyrus* is propagated by dividing the thick, creeping, underground rhizomes. The other species may be increased by dividing the crowns, or by means of seeds sown in pans of sandy loam, and raised in gentle heat.

Description of Plate 298. *Cyperus alternifolius*, the Alternate-leaved Cyperus; upper part of stems, natural size. Fig. 1 is a branch of the inflorescence bearing five spikelets. Fig. 2 is a flower separated from the spikelet, and consisting of the boat-shaped *glume* within which, and attached to its broad end, are the pistil and three stamens.

CLUB RUSHES

Natural Order CYPERACEÆ. Genus *Scirpus*

SCIRPUS (the old Latin name). A genus of about three hundred species of stove, greenhouse, or hardy annual or perennial aquatics and marsh plants. They are closely allied to *Cyperus*, but differ chiefly in the spikelets being usually clustered into oval heads, which are produced from the side of the stem. This difference of form (seen by comparing the Figs. 1 on Plates 298 and 299) is due to the attachment of the glumes all round the stalk, instead of on two sides only (though this arrangement will be found in one section of the genus). There is no representation of the perianth in some species, including *S. riparius*, but in most cases it will be found in the shape of from three to eight bristles below the ovary. There are three stamens, and the style is cleft into two or three lobes and jointed at the base, so that it falls off when its work is done. The plants have a creeping rootstock, and the few leaves are at the base of the stem, or absent altogether; they are either very long, small, and

grass-like, or reduced to mere sheaths closely investing the stem. The species are of world-wide distribution; fourteen British.

Principal Species.

SCIRPUS HOLOSCHŒNUS (whole-cord). Stems stout, erect, tapering, 2 to 3 feet high. Leaves few, erect, half-round, channeled, with rough margins. Spikelets minute, crowded into compact globular cymes. There is a variety *variegatus*, with whitish zones around the stem; this is the form chiefly cultivated.

S. LACUSTRIS (inhabiting lakes or pools). Bulrush. Stems 1 to 8 feet high, an inch thick, spongy, nearly round. Leaves usually absent; but when present, short, flat, and keeled if growing in still water, long and strap-shaped in streams. Spikelets red-brown, in a spreading terminal cyme. Native perennial.

S. RIPARIUS (riverside). Stems numerous, rounded, 8 inches long, drooping; leafless, except sometimes an imperfect short leaf at the base. The flowers are terminal, massed in one or two oval spikelets. Plate 299. It is known in trade lists as *Isolepis gracilis*. Australia, 1820.

S. SETACEUS (bristly). Stems thread-like, rounded, rigid, in tufts, 3 to 6 inches high. Leaves short and narrow, bristly, channeled. Spikelets one to three, oval, one-sided. Whole plant similar to *S. riparius*. Native perennial. Also known as *Isolepis setacea*.

Cultivation.

These plants grow naturally in a boggy soil, and the best substitute for it in cultivation is a mixture of loam and leaf-mould; or they will do well in peat. They require plenty of water; and when grown in hanging baskets or vases, as is frequently the case with *S. riparius*, it is advisable to stand the flower-pot in a saucer in which water may be poured; but this must not be allowed to become stale. Where there is a tank, or a fountain-basin, the pots may be stood in the water. *S. lacustris* is, from its size, more suitable for planting at the edge of water out of doors.

Description of Plate 299.

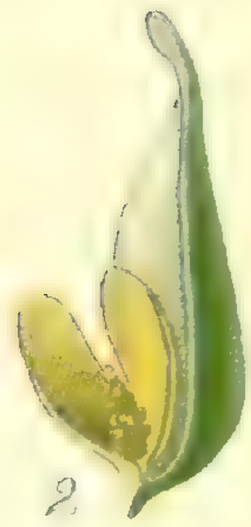
Scirpus riparius, natural size. Fig. 1, flower-stem with two spikelets; 2, a single glume detached, with stamens and pistil; 3, flower-stem, ending in single spikelet.

FEATHER GRASSES

Natural Order GRAMINEÆ. Genus *Stipa*

STIPA (Greek, *stype*, flax or tow: in allusion to the inflorescence). A genus of about a hundred species of perennial grasses, mostly tall, with the usual grass-like leaves, which, however, are rarely flat, but mostly

3



2

SELAGINELLA MARTENSII

Nat. size

PL. 303

one side rolled within the other (*convolute*). The flowers are arranged in terminal panicles, each spikelet containing three narrow, keeled glumes, of which the two outer ones are empty, the middle one containing the flower. They are natives of the Tropical and Temperate Regions, and few of them have been introduced for horticultural purposes.

History. *Stipa pennata, the* Feather Grass, has been grown in English gardens for hundreds of years. It is a continental species, and therefore likely to have been introduced at a very early date. It was certainly grown here three hundred years ago, for Gerard tells us the ladies of his day employed the flowers in lieu of feathers. *S. juncea* was introduced from France in 1772, and *S. gigantea* from Spain, 1823.

Principal Species. STIPA ELEGANTISSIMA (most elegant). Stems numerous, erect, and branching, 2 or 3 feet high. Leaves slender, mostly erect. Flowers in a loose, wide-spreading panicle, 6 or 8 inches long, with long plumose awns from the glumes.

S. GIGANTEA (gigantic). Stems, 3 feet high. Flowers in a loose panicle; glumes awl-shaped; awns slightly zigzag, downy, five times longer than the glumes.

S. PENNATA (winged or plumed). Feather Grass. Stems numerous, 2 feet high. Leaves rigid, grooved, bristly. Panicle long and slender; awns about a foot long, feathered to the point. Plate 300A.

Cultivation. The cultivation of this genus scarcely needs any comment. *S. elegantissima* makes a graceful pot-plant for the greenhouse, and the others do well in the border outside in almost any garden soil; but *S. pennata* will be found to flourish most in those that are dry and sandy. There is nothing attractive about this plant until the long feathered awns are developed. They may be propagated either by dividing the root, or by sowing seeds in spring.

Description of Plate 300. Feather Grasses. A, *Stipa pennata*, natural size, flowers only. Fig. 1, a single spikelet with its awn. B, *Pennisetum longistylum*, leaf and spike, natural size. Fig 2, a spikelet with its awns.

PENNISETUM GRASSES

Natural Order GRAMINEÆ. Genus *Pennisetum*

PENNISETUM (Latin, *penna*, a feather, and *seta*, a bristle). A genus of about forty species of (mostly) greenhouse grasses. The flowers have a double involucre consisting of many bristles, the inner ones feathered;

two to four in a spikelet. They are natives of Tropical and Sub-tropical Regions, chiefly African. Few of them are in cultivation, though *P. cenchroides* was introduced from the Cape of Good Hope one hundred and twenty years ago; *P. setosum*, from Brazil, in 1817; *P. compressum*, from Australia, in 1820; *P. latifolium*, from Monte Video, in 1869. *P. longistylum* is a native of Abyssinia.

Principal Species.

PENNISETUM LATIFOLIUM (broad-leaved). Stems stout, cane-like, purplish, 9 or 10 feet high. Leaves broad-lance-shaped, spreading, with a whitish line along the centre. Flowers in bushy nodding spikes. Perennial.

P. LONGISTYLUM (long-styled). Stems 2 feet high. Leaves long and slender. Flowers in oval, plumy spikes; August. Perennial. Plate 300B.

P. SETOSUM (bristly). Stems erect, 3 to 4 feet high. Leaves slender, smooth or hairy. Flowers in dense plumy spikes, purple, 6 inches long. Perennial.

Cultivation.

Most of the species grown in this country are treated as annuals, the seed being sown in spring. The chief reason for this consists in the destruction of the plants by our winters, but in some favoured districts they survive outdoors if given a little protection. It is also quite possible to grow them outside during the summer, and take up the roots on the approach of winter, storing them in a safe place. They are not particular as to soil, but planting them in rich, well-dug borders, brings out the best that is in them. *P. longistylum* is generally treated as though it were a half-hardy annual.

PAMPAS GRASS

Natural Order GRAMINEÆ. Genus *Gynerium*

GYNERIUM (Greek, *gyne*, a female, and *erion*, wool: in allusion to the woolly stigmas). A genus of three or four species of perennial Grasses distinguished by their showy flower-panicles, the spikelets of which are two-flowered, and the sexes on distinct plants. They are natives of Tropical and Sub-tropical America.

History.

Gynerium argenteum, the only well-known species, and the one that is cultivated in this country, is one of America's contributions to modern gardening. Its introduction was due to Mr. Tweedie, who in the year 1843 sent seeds from Buenos Ayres to the Royal Botanic Gardens at Glasnevin, where they were raised, and some of the plants distributed to similar establishments elsewhere. It is

PRICKLY SHIELD-FERN

(*A*) ASPIDIUM ACULEATUM (*B*) *var. subtripinnatum*

Nat. size

PL. 304

now widely cultivated throughout Britain and Europe, and when grown in well-developed tufts, 5 or 6 feet through, crowned by the enormous silvery plumes rising to 10 or 12 feet high, constitutes a splendid addition to any garden. It obtains its popular name from its abundance on the Pampas, those vast dry plains of Argentina. In most parts of this country it has proved sufficiently hardy to withstand ordinary winters out of doors, when once well established.

Principal Species.

GYNERIUM ARGENTEUM (silvery). Stems 8 to 12 feet high, forty or fifty springing from one well-grown plant. Leaves very narrow, with sharp-toothed edges, glaucous, about 6 feet long, arching and curling. Flowers in dense silky, plumy panicles, supported on stout, erect stalks; September. Ordinarily the panicles are silvery greyish white in colour, but there are varieties with the panicles of a purplish or a yellowish tint.

Cultivation.

Pampas Grass should be planted with an eye to the fact that it will become a large mass of graceful foliage and silver plumes; and, if possible, it should be given a roomy central position where it can develop its full proportions symmetrically. It is a good subject for the centre of a lawn, or for a deep border backed by a shrubbery or plantation, which will have the effect of setting off its general lightness of colour. The most congenial soil for it is light and sandy, enriched with stable manure. Where obtainable, it is best to plant divisions from mature specimens, as the seedlings, even with liberal treatment, will not flower until about four years old. Seeds should be sown under glass in a moist atmosphere, and the seedlings grown on in pots until large enough to plant outside, where they will need protection during their first winter. During the period of growth water must be given freely. In order to preserve the plumes for indoor decoration, they should be cut soon after they have fully expanded.

RIBBON GRASS AND CANARY GRASS

Natural Order GRAMINEÆ. Genus *Phalaris*

PHALARIS (the old Greek name). A genus of about ten species of grasses, of which only two are in cultivation. The inflorescence is a panicle, which, however, may be loose, compact, or spike-like. The spikelets are much compressed, each containing one perfect flower within two keeled empty glumes. Between these outer empty glumes will usually be found two or more minute scales, which are really

immature flowers. There are three stamens and a smooth ovary, with long styles and feathery stigmas. They are natives of the Tropical and Temperate Regions.

History. Of the two species of *Phalaris* cultivated, one, *P. arundinacea*, is a native, found on the margins of lakes and rivers. The natural green of the broad, flat, reed-like leaves becomes more or less reduced in the cultivated variety to longitudinal stripes of green upon a ground of pinkish white or creamy white. The other is a South European species, whose fruit is the familiar Canary seed so popular as a food for the smaller cage-birds.

Principal Species. PHALARIS ARUNDINACEA (Reed-like). Stems 3 to 6 feet high, from a creeping rootstock, stout and erect. Leaves lance-shaped, ½ inch broad. Spikelets oval, purplish, in a short-branched elongated panicle; July and August. Perennial. The var. *variegata*, with leaves alternately striped green and white, is well known in gardens under the names of Ribbon Grass and Lady's Garters. Plate 301.

P. CANARIENSIS (Canary). Canary Grass. Stems 1 to 3 feet high, erect, somewhat rough. Leaves flat, glaucous, upper sheaths inflated. Spikelets round, in a compact oval or nearly cylindrical panicle; empty glumes with broad wings and green keel; July. Annual.

Cultivation. Either of these plants will do well in almost any garden soil. *P. arundinacea* forms large masses by means of its creeping rootstocks. Propagation of this species is readily effected by dividing the mass. *P. canariensis* is raised from seed sown in the border in spring. Its flower-panicles are very distinct among grasses, and are useful for interspersing among cut flowers; for which purpose the leafy stems of Ribbon Grass are much in request. A well-established clump will bear considerable cutting in this way.

Description of Plate 301. *Phalaris arundinacea*, var. *variegata*, the Ribbon Grass; upper part of stems, with flower panicle. Fig. 1 is a spikelet removed; 2 is the same, with the two empty glumes separated.

QUAKING GRASS

Natural Order GRAMINEÆ. Genus *Briza*

BRIZA (Greek, *brizo*, to be drowsy: in allusion to the nodding of its heads). A genus of about ten species of hardy ornamental grasses, with many-flowered, drooping, oval or heart-shaped spikelets in loose panicles. The flowering glumes sheathe or overlap each other, and are boat-shaped.

ASPIDIUM FALCATUM

Nat. size

PL. 305

There are two empty glumes, longer or shorter than the lowest of the series of flowering glumes. There are three stamens, the ovary is smooth, the styles short, and the stigmas feathery. The species are natives of the Temperate Regions of Europe, Asia, Africa, and South America; two British.

History. *Briza media*, one of our native grasses, grows in meadows and on heaths throughout the country, and is eagerly sought by children of all ages, for the sake of its ever-trembling spikelets. *B. minor*, the only other British representative of the genus, is much more restricted in its range—is, in fact, a purely southern form: South of England, South of Ireland. These have doubtless always been gathered to give lightness to the posy of wild flowers, and for their dried panicles to fill the flower vases in winter. Therefore they were probably cultivated in gardens at times. But in the year 1633 the large-flowered *B. maxima* was introduced from South Europe, and has continued to be most in favour for horticultural purposes. Ten years ago there was introduced from Brazil an annual species named *B. rotundata*; and this about completes the list of those worthy to be admitted into our gardens.

Principal Species. BRIZA MAXIMA (largest). Leaves long and slender. Spikets oblong, heart-shaped, containing from thirteen to seventeen flowers, nodding, and the panicle itself nodding at its extremity; June and July. Annual. Plate 302A. Frequently dried and dyed, to make into bouquets with Immortelles.

B. MEDIA (middle-sized). Quake Grass, or Quake. Stems solitary, at first creeping, then more erect, 6 to 18 inches high, slender. Leaves flat. Spikelets oval, five- to nine-flowered, shining green or purplish, the empty glumes shorter than the first flowering glume; June. Perennial.

B. MINOR (smallest). Little Quake Grass. Stems tufted, 4 to 10 inches high. Spikelets much smaller than those of *B. media*, but more numerous, and broader than long, the empty glumes longer than the first of the flowering glumes; July. Annual.

B. ROTUNDATA (round). Leaves slender, erect. Spikelets erect, in narrow panicles. Annual.

Cultivation. *Brizas* will succeed in ordinary garden soils; but to grow them well, they should be planted in a compost containing loam, peat, and leaf-mould. They are propagated by means of seed, which may be sown either in spring or autumn, but preferably in autumn. Where it is desired to make use of the panicles for winter decoration, these should be cut as soon as the spikelets are well formed and hanging gracefully, and thoroughly dried in the shade.

Description of Plate 302. A, *Briza maxima*, Large Quaking Grass, natural size.

B, *Lagurus ovatus*, the Hare's-tail Grass, natural size. Fig. 1 is a separated spikelet of this species, and Fig. 2 a seedling.

C, *Aira pulchella*, the Hair Grass, natural size. B and C will be found described below.

HARE'S-TAIL GRASS

Natural Order GRAMINEÆ. Genus *Lagurus*

LAGURUS (Greek, *lagos*, a hare, and *oura*, a tail: in allusion to the appearance of the inflorescence). A genus consisting of but one species, a hardy annual, native of Europe, North Africa, and Western Asia. It occurs in Guernsey, and has been naturalised in Essex.

Species. LAGURUS OVATUS (egg-shaped). Stems numerous, stout, downy, erect, leafy below, 6 to 10 inches high. Leaves short, broad. Spikelets massed in a dense, silvery-white, shaggy head, nearly an inch across; June. Each spikelet is composed of two empty glumes and one flowering glume. (See Plate 302, Fig. 1.) The empty glumes are much longer than the other, and end in long feathery points. The flowering glume is slender, rounded, with two short awns and a very long bent and twisted one.

Cultivation. Hare's-tail Grass thrives best in a sandy soil, and is raised from seed, which may be sown in spring or autumn. The best plants, with the largest number of flowering stems, are obtained by sowing the seed as soon as ripe in pots of sandy soil out of doors, bringing them into a cold greenhouse or frame before winter sets in, and planting out in spring. Or they may be kept in the pots for flowering.

HAIR GRASSES

Natural Order GRAMINEÆ. Genus *Aira*

AIRA (the old Greek name for a species of Grass). A genus of four or five species of hardy Grasses with two-flowered spikelets arranged in a light, loose panicle, on fine, wavy, hair-like branches. There are two nearly equal empty glumes, and the flowering glumes are convex, toothed, and awned at the back. There are three stamens, a smooth ovary, and

the stigmas are feathered to the base. The species inhabit the Temperate Regions of the world; and two of them are British, but these have more agricultural than horticultural interest.

Principal Species.

AIRA PULCHELLA (pretty). Stems tufted, thread-like, 6 to 8 inches high. Leaves very short. Flowers in large, loose panicles; branches exceedingly fine and hair-like, repeatedly forked; June. Annual. Introduced from Spain, 1820. Plate 302c.

DESCHAMPSIA FLEXUOSA (waved), formerly included in the genus *Aira*, is a native perennial worth growing. Its stems are about a foot high, and the panicle loose and spreading, with wavy, angled branches, and shining purplish or yellow-brown spikelets; June to August.

AGROSTIS NEBULOSA (misty). Cloud Grass. A European annual whose panicles are very similar to those of *Aira pulchella*, but examination of the spikelets reveals only one flower instead of two.

Cultivation.

All these are of the simplest to grow. Any garden soil will suffice for them; and the seeds should be sown in the border, or in pots, as desired, in spring. They will be found especially useful to cut for bouquets.

Many other species of ornamental grasses might be described did space allow, but these scarcely come within the scope of the present work. Those we have named are a mere acknowledgment that grasses are well worthy of the attention of the horticulturist; and a similar remark will apply to the Selaginellas and Ferns next to be noticed in the completion of our task. About three thousand five hundred species of Ferns and their allies are known (to say nothing of their very numerous varieties), and over a thousand of these are in cultivation. Readers will therefore understand that in giving up a few pages of our book to the description and illustration of a very small sample of these graceful and interesting plants, we are as far as possible from making any pretence of dealing with the group in the manner they deserve.

SELAGINELLAS

Natural Order SELAGINELLACEÆ. Genus *Selaginella*

SELAGINELLA (the diminutive of *Selago*, the old name of a species of *Lycopodium*). A genus of about three hundred species of *Vascular Cryptogams*, differing from the plants we have hitherto been considering in the fact that (in common with Ferns, Mosses, Seaweeds, etc.) they produce no flowers, but are propagated by spores. These are single cells,

which give rise to a scale-like cellular body, called a *prothallus*, upon which sexual organs are developed, by which is in turn produced an embryo capable of growth into a plant like that on which the spore originated. In *Selaginella* the stem is always slender, erect, or trailing, and repeatedly forking, often in one plane only. The leaves are small, simple, in four rows, overlapping; on the upper side near its base the leaf bears a process called a *ligule*. The spore-case (*sporange*) springs from the upper side of the leaf beneath the ligule. The fertile leaves form a compact, square, terminal spike (Plate 303, Fig. 1). The species are distributed over the whole of the globe, but abound chiefly in the Tropics; only one occurs in Britain.

History. These plants were formerly included among the *Lycopodiaceæ*, and as cultivated plants may be considered quite modern; the larger number of species, in truth, are of recent discovery and introduction. Among the earliest to receive attention was *Selaginella kraussiana*, commonly known as *S. denticulata*, introduced from Madeira in 1779, the variety *aurea* being introduced in 1878; *S. apus*, from Canada, in 1819; and *S. grandis*, from Borneo, in 1882. The handsome, erect-growing *S. tassellata* came from Brazil in 1887. *S. serpens* exhibits a remarkable change of colour in the living plant—in the morning it is bright green, but as the day advances it gradually becomes very pale, almost white. This is due to the contraction of the green colouring matter of the cells under the influence of sunlight. Another species, *S. lepidophylla*, is hygrometric; when dried, its stems and branches contract and curl into a ball, and in this condition it is sold in fancy warehouses under the name of Resurrection Plant. When placed in water it uncurls and assumes it natural shape.

Principal Species. SELAGINELLA APUS (footless). Stems trailing, densely matted, 2 to 4 inches long, with distant, short, half-erect, half-spreading branches. Spikes $\frac{1}{4}$ to $\frac{1}{2}$ inch long. Stove or greenhouse. Also known as *S. apoda* and *S. densa*.

S. ATROVIRIDIS (blackish green). Stems half-erect, 6 to 12 inches long, much branched. Spikes $\frac{1}{2}$ to 1 inch long. Tropical Asia. Stove.

S. CAULESCENS (stemmed). Stems stiff and erect, 6 to 12 inches high, branched above only. Spikes $\frac{1}{4}$ to $\frac{1}{2}$ inch long. Tropical Asia. Stove.

S. ERYTHROPUS (red-footed). Stems crimson, about 9 inches long, unbranched so far as regards the lower third, above this much branched, and the whole triangular. Tropical America. Stove.

S. GRANDIS (great). Stems erect, $1\frac{1}{2}$ to 2 feet long. Lower half unbranched, much branched in fan-shape above. Stove.

BIRD'S-NEST FERN

(ASPLENIUM NIDUS)

$^1/_6$ Nat. size

PL. 306

S. HÆMATODES (bloody). Stems 1 to 2 feet long, bright crimson; lower half unbranched, upper part branched and assuming triangular form. A large, handsome species. Tropical America. Stove.

S. KRAUSSIANA (Krauss'). Stems trailing, ½ to 1 foot long, with numerous branches and half-erect branchlets. Spikes short. Greenhouse. The var. *aurea* is of a greenish yellow colour.

S. MARTENSII (Martens'). Stems 6 to 12 inches long; lower half trailing, upper somewhat erect; branches wavy. Mexico. Greenhouse. Plate 303. There are numerous varieties of this well-known species.

S. WILLDENOVII (Willdenow's). Stems climbing, 12 to 20 feet long; branches spreading, 1 to 2 feet long. Branchlets short and close together; blue tinged. Tropical Asia. Stove.

Cultivation. Selaginellas should be treated exactly like Ferns. They succeed in any light soil, but do best in a mixture of fibrous peat, leaf-mould, and silver sand. Shade and moisture are the only other requirements additional to the appropriate temperature, as indicated for the different species. When grown in pots, those of very dwarf habit look well if the soil is heaped up in the middle above the top of the pot, and the *Selaginella* planted thereon. Some of the species are useful for growing in baskets or pans suspended from the roof. All the small species are most effective when grown in pans a foot in diameter. *S. helvetica* is a hardy species, and is useful in the rock-garden. Propagation is easily effected by cutting off portions of the creeping stems to which roots are attached, and keeping them close until established.

Description of Plate 303. *Selaginella Martensii*, natural size. Fig. 1 is a spike enlarged, showing the yellow sporange between the leaf and the ligule; 2 is a ligule and sporange, further enlarged; 3 is the sporange separated.

FERNS

Natural Order FILICES

FILICES (Latin, *filix*, a fern). This order contains not less than seventy-five genera, from which we can only select half a dozen genera as examples. In nearly all cases Ferns are perennial plants, sometimes shrubby or tree-like, or with creeping rootstocks. The leafy expansions are called *fronds*, and they vary from the simple strap-shape of *Scolopendrium*, to the pinnately-cut *Polypodium vulgare*, and to forms that are once, twice, thrice, and even four times pinnate. These fronds

are attached to the rootstock either in tufts or alternately, and are at first rolled up tightly with the tip of the frond in the centre of the coil, and the divisions of the frond rolled up in like manner. The frond-stalk is termed a *stipes*, and its continuation through the leafy portion of the frond is the *rachis*. The primary divisions of a frond are *pinnæ*; the divisions of a *pinna* are *pinnules*. They are propagated by means of spores, similar in nature to those of *Selaginella*. In all the Ferns these are microscopic, and contained in very minute capsules (*sporanges*), which are in turn massed in heaps or ridges, known as *sori*, on the back of the frond, and frequently covered with an *involucre* or *indusium*. The species are widely distributed over all except the very cold and arid regions, chiefly abounding in the Temperate and Tropical, especially where there is humidity. The British species number thirty-eight, but of this small number about six hundred *varieties* are in cultivation at Kew. In the following descriptions the foot-stalk (*stipes*) and the leafy portion (*frond*) are measured separately.

SHIELD FERNS

Natural Order Filices. Genus *Aspidium*

Aspidium (Greek, *aspis*, a shield: the form of involucre). A genus of about fifty-five species, with the sori globose, on the veins of the pinnules, covered by a roundish involucre attached by its middle. They are natives of all regions, and two species are found wild in Britain.

History.

We have as representatives of this genus in our native flora, *Aspidium Lonchitis*, the Holly Fern, which grows on northern alpine rocks, and *A. aculeatum*, the Prickly Shield Fern, which is widely distributed, not only in our own country, but throughout the world. Several species have been manufactured out of the varieties of *A. aculeatum* by "splitting" botanists, and the garden varieties can only be represented by three figures. Several of the exotic forms have been in cultivation here for many years, though of most the date of introduction has not been recorded. *A. trifoliatum*, a Tropical American plant, was introduced from the West Indies in 1769; and *A. auriculatum*, from the East Indies, in 1793.

Principal Species.

Aspidium acrostichoides (Acrostichum-like). Stipes densely scaly below, 6 to 8 inches. Frond 1 to 2 feet long, 2 to 6 inches across. Pinnæ 2 to 3 inches long, spiny-toothed, the lobes nearest the *rachis* enlarged, and looking like ears (*auricled*). The

under side of the upper, smaller pinnæ entirely occupied by the sori. Native of North America. Hardy. The var. *grandiceps* has the tips of the rachis branched, giving a tasselled appearance to the frond. The var. *incisum* has the pinnules more deeply cut and sharply lobed.

A. ACULEATUM (sharp-pointed). Prickly Shield Fern. Stipes tufted, 6 to 12 inches, more or less scaly. Fronds 1 to 3 feet long, 6 to 12 inches across, oval, lance-shaped. Lower pinnæ 4 to 6 inches long, lance-shaped; the pinnules somewhat rhomboid, toothed, and eared, the tips and ear ending in a spiny point. Sori on the pinnules in a row on each side of mid-vein. Hardy native. Plate 304A. The sub-species, *angulare*, the Soft Prickly Shield Fern, is of softer texture, the lower pinnæ larger, and the pinnules stalked and more equal in size. The var. *subtripinnatum* is less deeply divided. Plate 304B.

A. ARISTATUM (awned). Rootstock creeping; stipes scattered, 9 to 18 inches long, covered with scales at base. Fronds 1 to 2 feet long, 9 to 12 inches broad, triangular-oval, three or four times divided. Lower pinnæ and lowest pinnules much the largest; teeth numerous, ending in long points or awns. Sori small, in two rows near mid-vein. Native of Tropical Asia, but succeeding in greenhouse.

A. CAPENSE (Cape of Good Hope). Rootstock creeping, covered with dark brown scales. Stipes scattered, 1 to 2 feet long, densely scaly below. Fronds 1 to 3 feet long, 12 to 18 inches broad; lowest pinnæ the largest, 6 to 9 inches long. Pinnules lance-shaped. Sori large and numerous. Native of the Southern Temperate zone. Greenhouse.

A. FALCATUM (hooked). Stipes tufted, 6 to 12 inches long, densely scaly below. Fronds 1 to 2 feet long, 6 to 9 inches broad. Pinnæ numerous, elliptical, lance-shaped, blunt-toothed or entire-edged, dark green. Sori small, numerous, and scattered. Native of Japan, etc. Evergreen in greenhouse, but, though hardy, shedding its fronds if wintered outside. Plate 305.

A. LASERPITIIFOLIUM (Laserpitium-leaved). Stipes 4 to six inches long, scaly at base. Fronds 12 to 18 inches long, 6 to 9 inches broad, triangular-oval, tripinnate. Lowest pinnæ the largest; the lower pinnules longer than upper, bluntly lobed, overlapping. Sori very numerous, in two rows. Native of Japan. Greenhouse.

A. LONCHITIS (spear-like). Holly Fern. Stipes densely tufted, stout, and scaly, 1 to 4 inches long. Fronds 1 to 2 feet long, 1 to 3 inches broad, narrow-oblong, leathery, pinnate. Pinnæ numerous, smooth, rhomboid, with hooked tip and spiny teeth: base eared. Hardy native.

A. MUNITUM (armed). Stipes tufted, 4 to 9 inches long, densely scaly. Fronds 1 to 2 feet long, 4 to 8 inches across, pinnate. Pinnæ 2

to 4 inches long, toothed and spiny, partly overlapping. Sori in two rows. California. Hardy.

A. TRIANGULUM (triangular). Stipes tufted, scaly based, 2 to 6 inches long. Fronds 1 foot long, 1½ to 2 inches across, pinnate. Pinnæ somewhat triangular, with a firm point at apex, margin almost entire or slightly lobed and toothed, eared at base. Sori in two rows near margin. Native of West Indies. Stove or greenhouse.

Cultivation. In common with most Ferns, *Aspidiums* require a well-drained, light, porous soil, which will admit of copious waterings without danger of getting sour. A compost that shall be pretty generally suitable for Ferns is arranged thus: to two parts of good loam add one part each peat and leaf-mould, or two parts leaf-mould. To this should be added small quantities of silver sand, broken crocks, charcoal, and bits of porous sandstone—or such of them as may be available. Give special attention to the drainage, for Ferns quickly succumb to stagnating moisture at their roots. The hardy species may be grown in a partially shady position outside, or in pots in a cool house. They are propagated by dividing the crowns, or by the long and tedious process of raising them from spores sown in pans of peat, kept moist and shaded, until the first fronds are formed on the prothallus. These young plants are exceedingly fragile, and must be very delicately picked out from the less advanced individuals by means of a fine-pointed little stick, and as carefully transferred to other pans, and put in an inch apart; to be again transplanted into small pots when there is a danger of their becoming crowded in the pans. The only manure that should be given to Ferns should be in a weak liquid form, or well-rotted cow-manure should be incorporated with the compost.

Description of Plate 304 and 305. Plate 304A. *Aspidium aculeatum*, the Prickly Shield Fern. B, The var. *subtripinnatum*. The separate figure is the under side of a pinnule (enlarged), showing the sori and their coverings.

Plate 305. *Aspidium falcatum*. Fig. 1 is a small portion of a pinna enlarged, showing the sorus, covered and uncovered.

SPLEENWORTS

Natural Order FILICES. Genus *Asplenium*

ASPLENIUM (Greek, *a*, not, and *splen*, the spleen: in allusion to their ancient reputation as medicines for the spleen). A genus of about two

OSTRICH FERN

(ONOCLEA GERMANICA)

Nat. size

PL. 307

hundred and eighty species of Ferns, usually with a short tufted root-stock, and fronds of very various forms. The generic character is found in the sori, which are long and narrow, oblique, and distant from the midrib—except in those cases where (as in Lady Fern) the frond is much divided. The involucre is long and narrow, attached to the vein by one side, and opening towards the midrib. The species are natives of all Regions except the very cold; ten species are British.

History. This genus is so large, and the species assume so great a variety of forms, that, unless studied botanically, it presents many difficulties. As we have already hinted, the key to the classification of Ferns lies in those little brown patches of spore-cases on the back of the frond; but even these have to be regarded carefully, as will be experienced by the student of Aspleniums. To those who place reliance on superficial resemblances, it is certainly a puzzle to find *Asplenium nidus*, with Hart's-tongue-like fronds, *A. trichomanes*, *A. marinum*, and *A. filix-fœmina*, associated in one genus. In the not remote past these differing forms have been separated in different genera, and even now certain species are so separated by some of our systematists. The name *Asplenium* is a very old one, for Dioscorides applied it to our Rusty-back, *A. Ceterach*. Several species—as, for instance, *A. bulbiferum*—produce a number of young plants upon their fronds; and when these, in the usual course, wither and fall to earth, the young plants readily root themselves. Several of the exotic species have been in cultivation here for a considerable period. *A. rhizophyllum* having been introduced from North America in 1680; *A. Hemionitis* and *A. ebeneum*, in 1779; *A. monanthemum*, in 1790; and *A. fragrans*, in 1793.

Principal Species. ASPLENIUM ALATUM (winged). Stipes 4 to 6 inches high, the upper part winged, and the wings continued along the rachis. Fronds 1 to 1½ foot long, 3 to 4 inches across, pinnate. The pinnæ bluntish, of nearly equal width (½ inch) throughout. Sori distant, not reaching margin or midrib. Tropical American species, requiring stove treatment.

A. CETERACH (Arabian name). Scale Fern, or Rusty-back. Stipes densely tufted, 1 to 3 inches long, scaly. Fronds 4 to 8 inches long, pinnately lobed, leathery, the back densely clothed with toothed, rusty scales. Sori hidden beneath the scales, with scarcely any involucre. Native, chiefly in Western Counties. Hardy.

A. CULTRIFOLIUM (ploughshare-shaped leaves). Stipes 4 to 6 inches. Fronds 6 to 12 inches long, 4 to 6 inches across, twice pinnate, oval-triangular; pinnæ 3 to 4 inches long, broadly toothed or lobed. Sori clear of edge and midrib. Introduced from the West Indies, 1820. Stove.

A. DIMORPHUM (two-formed). Stipes tufted, 6 to 12 inches long. Fronds 2 to 3 feet long, over a foot across, triangular-oval; lower pinnæ of similar shape to frond, 6 to 8 inches long, bluntly toothed. Sori-bearing pinnæ very narrow, sometimes forked; sori marginal. Native of Norfolk Island. Warm greenhouse.

A. FALCATUM (hooked). Rootstock creeping, chaffy. Stipes tufted, 6 to 9 inches long. Fronds 6 to 18 inches long, 4 to 6 inches across, lance-shaped. The pinnæ stalked, oval, unequal-sided, ending in a curved point. Sori in long irregular lines, reaching nearly to the edge. Introduced from Polynesia, 1825. Greenhouse.

A. FILIX-FŒMINA (Lady Fern). Rootstock stout, several inches above surface. Stipes 6 to 12 inches long, stout, brittle, brown or pale yellow, scaly below. Fronds large, oblong, lance-shaped, twice or thrice pinnate, thin textured, soft and waving. Pinnæ lance-shaped, close-set; pinnules coarsely toothed, or cut pinnately. Sori small and numerous, with a short oblong or kidney-shaped involucre. Native, and of world-wide distribution. Hardy. In addition to several important natural varieties, over three hundred garden varieties have been named, some of them extraordinary departures from the type.

A. FLABELLIFOLIUM (fan-leaved). Stipes tufted, 3 to 6 inches long. Fronds procumbent, straggling, 6 to 12 inches long, and not exceeding an inch across, rooting at the tip. Pinnæ fan-shaped, lobed, $\frac{1}{4}$ to $\frac{1}{2}$ inch across. Sori oblique, numerous, but irregularly scattered. Introduced from Temperate Australia, 1820. Greenhouse.

A. HEMIONITIS (Hemionitis-like). Stipes tufted, 4 to 8 inches long. Fronds spear-shaped, 4 to 6 inches either way. Sori narrow, upon the veins. Native of South Europe and North Africa; introduced 1779. Cool greenhouse.

A. MARINUM (sea). Sea Fern; Sea Spleenwort. Rootstock stout, clothed with purple-brown scales. Stipes 3 to 6 inches, red-brown, stout, polished. Frond 3 to 10 inches long, oblong or lance-shaped, leathery, glossy, pinnate; rachis winged. Sori large and oblique; involucre leathery. Native; but if away from the sea will only grow under glass, in humid atmosphere.

A. NIDUS (nest). Bird's-nest Fern. Stipes very short. Frond lance-shaped, undivided, 2 to 4 feet long, 3 to 8 inches broad, tapering downwards; margin entire, midrib rounded at back. Sori starting near midrib and extending half-way to margin. Introduced from India, 1820. Greenhouse. Plate 306.

A. TRICHOMANES (soft-haired). Maidenhair Spleenwort; English Maidenhair. Rootstock stout. Stipes crowded, 1 to 4 inches long,

polished red-brown, black at base, not scaly. Frond 6 to 12 inches long, of nearly equal width (about ½ inch) throughout. Pinnæ oval, fifteen to forty in number, about ¼ inch long. Rachis rigid, chestnut-brown. Sori short, oblique, with pale brown involucre. Native. Hardy.

A. VIVIPARUM (bearing live plants). Stipes tufted, 6 to 9 inches long. Fronds 1 to 2 feet long, 6 to 8 inches across, oval, lance-shaped; pinnæ numerous and crowded, 3 to 4 inches long; pinnules deeply and pinnately lobed. Sori solitary, marginal. Surface of frond producing a large number of young plants. Mauritius, 1820. Greenhouse.

Cultivation. The cultural directions given for *Aspidium* apply generally to *Asplenium*. The stove and greenhouse species should be potted in the peat-loam-sand compost, whilst the hardy species do well in a mixture of peat and sand, or leaf-mould and sand. *A. Filix-fœmina* must have plenty of free moisture, or its fronds will rapidly wither and never recover. *A. Ceterach* and *A. Trichomanes* naturally grow in the mortar of old walls, and old mortar and brick rubbish should be mixed in the potting soil, which should be built up above the rim of pot. *A. marinum* grows above sea-caves, often with its rootstock squeezed into fissures of the rock, and this position should be imitated in cultivation. Propagation is effected by dividing the rootstock when two or more crowns have been formed; by the buds ("bulbils") developed on the fronds of many species, or by raising spores as instructed under *Aspidium*.

Description of Plate 306. *Asplenium Nidus*, the Bird's-nest Fern, reduced to about one-sixth of its natural proportions. This is the largest known Fern having undivided fronds. Fig. 1 is a portion of a frond showing the back, with the sori.

OSTRICH FERN

Natural Order FILICES. Genus *Onoclea*

ONOCLEA (Greek, *onos*, a beaker, and *kleio*, to close: in allusion to the rolled up pinnæ of the fertile fronds and the shape of the involucre). A genus of three species of hardy Ferns, whose spore-bearing (*fertile*) fronds have the margins of the pinnæ rolled in to the midrib behind, entirely concealing the fructification. The sori are round, on the veins of the pinnæ, and the involucre is hood-like, or half-cup-shaped, originating from the under side of the sorus. They are natives of the Cold and Temperate Regions.

History. The typical species of this genus is *Onoclea sensibilis*, a North American plant, which has been in cultivation here for two hundred years. We have it on the evidence of Jacob Bobart, keeper of the Oxford Botanic Garden, that it was growing there in 1699, having been introduced from Virginia. *O. germanica* is a native of Europe and North America, which was introduced by Peter Collinson in 1760. *O. orientalis* is a much more recent addition to our ferneries, whose native habitat is Assam, Sikkim, and Japan.

Species. ONOCLEA GERMANICA (German). Ostrich Fern. Rootstock erect, 9 inches high; also sending off underground branches to a distance of 6 or 7 feet, from which new crowns arise. Stipes short, enlarged at base and covered with blackish scales. Frond broad, lance-shaped, 3 to 5 feet long; pinnæ very numerous, the largest about 5 inches long, lower ones short, turned downwards. The pinnæ are cut into many blunt, smooth-edged segments. The fertile or spore-bearing fronds are quite different, and usually about three in number, not produced until autumn. They are 1½ to 2 feet long, with a broader, flatter rachis; the pinnæ are much contracted, pointing upwards, of a brown colour and a knotted appearance. Unrolling one of these fertile pinnæ about September, the sori will be found to be round, several of them uniting into one mass. It is also known as *Struthiopteris germanica* and *Onoclea Struthiopteris*. Plate 307.

O. ORIENTALIS (Eastern). Fronds oval-oblong, not greatly narrowed at base, 1 to 1½ foot long; pinnate. The fertile fronds are produced within the circle of barren ones, which they often exceed in length; pinnæ with margins curled back, dark purple-brown, glossy. Also known as *Struthiopteris orientalis* and *S. japonica*.

O. SENSIBILIS (sensitive). Rootstock naked, creeping, and branching extensively. Stipes 3 inches long. Fronds broad-triangular in outline, divided into oblong, lance-shaped pinnæ, which are entire or wavy-toothed. The fertile fronds are twice-pinnate, but the pinnules are curved back over the sori, and the pinnæ thus have a rounded appearance. Its sensibility consists in its fronds withering as though scorched on being handled slightly.

Cultivation. *Onoclea germanica* and *O. orientalis* succeed best in a soil of a good strong loamy character, to which leaf-mould is added. *O. sensibilis* does better in a soil that consists almost entirely of leaf-mould and sand. In such a soil it will make rapid headway, sending out creeping branches in all directions, and, filling up the pot with its roots, will creep over the rim and down the side. Although this species is hardy, like the others, yet it is best grown in a

PTERIS QUADRIAURITA, *var. argyræa*

Nat. size

PL. 308

cool greenhouse, where its thin-textured fronds are less likely to be shrivelled by wind or drought. These species are readily propagated by dividing the rootstock.

Description of Plate 307. *Onoclea germanica*, the Ostrich Fern, reduced. The lines under the figure should describe it as "one-third natural size," but the "one-third" has been inadvertently omitted. The upper portions of both fertile and sterile fronds are shown. Fig. 1 is an enlarged representation of part of a pinna, showing the sori and their involucres.

FEATHER FERNS

Natural Order Filices. Genus *Pteris*

Pteris (the old Greek for Ferns, from *pteron*, a feather or wing, in allusion to the plumy appearance of the frond). A genus of about eighty-three species of stove, greenhouse, and hardy Ferns. As there is no popular term generally applied to this genus, we have called them by the English of the generic name, although this savours of tautology. There is great variation of habit in this genus, but the rootstock is usually creeping, the veins of the frond forked or netted, the sori in continuous lines under the curled-back edge of the frond, with which the involucre is united. They are distributed widely over all the Regions of the earth; one only, the Bracken, *Pteris aquilina*, being British.

History. Our common Bracken, *Pteris aquilina*, has a very extensive history, for it has played an important part in Folk-lore and popular superstition; but its chief connection with gardens has consisted in the use of its fronds as a handy packing material for fruit and plants. There is no evidence of foreign species of *Pteris* being grown here prior to 1770. In that year Mr. James Gordon brought *P. longifolia* from the West Indies, and in the same year *P. serrulata* came from India. Eight years later Mr. Francis Masson introduced *P. arguta*, from Madeira. An important period in the cultivation of *Pteris* appears to have been about the year 1820. Then came the familiar *P. cretica*, from Crete; *P. heterophylla*, from the West Indies; and *P. tremula*, from Australia. Next year came *P. palmata*, from Caraccas, in 1824 *P. leptophylla*, from Brazil, whence also came *P. saggitifolia*, a year later.

Principal Species. Pteris arguta (sharp-notched). Rhizome creeping, covered with dark-brown scales. Stipes erect, 1 foot long, yellow or brown. Fronds 1 to 3 feet long, 1 foot across, thin-textured

and drooping; general form oval. Pinnæ few, very large, oblong, lance-shaped; pinnules of similar shape, but somewhat curved forward, finely and sharply toothed; lowest pinnules sometimes again divided. Sori on lower part of frond, of variable length, but not occupying whole margin of segments. Greenhouse.

P. CRETICA (Cretan). Stipes tufted, 6 to 12 inches long, yellowish brown. Fronds of equal length with stipes, 4 to 8 inches across, pinnate, firm-textured; lowest pinnæ again divided. Pinnæ slender, long, tapering to a long fine point. Sori in broad lines, continuous along three-fourths of margin of pinnæ. No true involucre. The var. *albo-lineata* has a white streak down the whole centre of the frond. Greenhouse.

P. ELEGANS (elegant). Stipes 1 foot long. Fronds 6 to 12 inches long, triangular, heart-shaped, twice pinnately-cut. The lobes are lance-shaped, cut nearly to the rachis, and the lower ones with from one to four lance-shaped pinnules on the lower side, usually none on the upper side. Sori continuous along margin. Native of South Brazil. Stove.

P. HETEROPHYLLA (various-leaved). Stipes wiry, erect, yellowish. Fronds oval, wedge-shaped, 6 to 12 inches long, 3 to 6 inches across, thrice-pinnate. Uppermost pinnæ simple, lowest wedge-shaped, pinnate, and the pinnules again divided, the lobes sharply and deeply toothed. broad, pale, thin-textured. Stove.

P. LEPTOPHYLLA (thin-leaved). Stipes 6 to 9 inches long, erect, yellowish. Fronds triangular, 9 to 12 inches long either way; upper pinnæ simple, an inch long; central ones lance-shaped, pinnate; lowest pinnæ wedge-shaped, the pinnules as much as 2 inches long, and pinnately-lobed. Sori not extending to the tips of the segments. Stove.

P. LONGIFOLIA (long-leaved). Stipes stout, erect, 6 to 12 inches long, pale, scaly at base. Fronds 1 to 2 feet long, 4 to 9 inches across, oblong, lance-shaped, tapering below. Pinnæ numerous, 3 to 6 inches long, very slender, with entire margins. Involucres yellowish brown, thin textured. Stove.

P. PALMATA (hand-shaped). Stipes 1 foot long, chestnut-brown, erect. Fronds 4 to 9 inches long, and as broad; barren fronds, with a broad undivided centre, from which five triangular lobes run off; the lobes of the fertile fronds are narrower and cut nearer to the rachis. The sori are continued to the tips of the lobes. Stove.

P. QUADRIAURITA (four-eared). Stipes 1 to 2 feet long, erect, yellowish or brownish. Fronds 6 inches to 3 feet long, 4 to 12 inches across. Pinnæ 6 to 12 inches long, divided, nearly to the rachis, into numerous entire-edged or slightly-toothed blunt lobes. The lowest

SPIDER FERN

(PTERIS SERRULATA)

Nat. size

PL. 309

pair of pinnæ branching near the base. Sori often continued along entire edge of lobes. The var. *argyræa* (figured in Plate 308) has a more or less distinct band of white down the centre of the pinnæ. Stove.

P. SAGGITIFOLIA (arrow-leaved). Stipes 4 to 6 inches long, erect, blackish. Fronds 4 to 6 inches long, spear-shaped or arrow-shaped, with entire margin and blackish midrib. Sori continuous. Stove.

P. SERRULATA (saw-edged). Spider Fern. Stipes 6 to 9 inches long, erect, pale brownish. Fronds 9 to 18 inches long, 6 to 9 inches broad, cut bipinnately into very narrow, long segments. Rachis winged, broader above. Pinnæ in distant opposite pairs, upper ones simple, 4 to 6 inches long, lower ones with several pinnules, the edges of the barren ones spiny-toothed. Involucres narrow. Greenhouse. Plate 309. There are a number of garden varieties of this species.

P. TREMULA (trembling). Stipes 1 foot long, erect, brown. Fronds 2 to 4 feet long, ½ to 2 feet across. Upper pinnæ pinnately divided into numerous lobes, the largest 6 inches long; lower pinnæ compound, nearly a foot long. Sori almost covering the segment. Greenhouse.

Cultivation. The general directions for Fern culture already given must be observed in regard to this genus. As a rule, the species do well in a compost of sandy loam and peat. The stove and greenhouse kinds will be found suitable for planting on an indoor rockery. Several of the greenhouse kinds may be grown in pots, with a view to plunging these in summer in a sheltered fernery out of doors, taking them in again in autumn. These are also much used for table and window decoration, among the most suitable for this purpose being *P. cretica*, *P. serrulata*, and *C. arguta*. The common *C. aquilina*, or Bracken, which we have not considered necessary to describe, if grown in a moist, shady greenhouse produces magnificent arching, broad, lace-like fronds, altogether different in appearance from those developed when growing on dry heaths. It requires a roomy pot or tub to accommodate its horizontal underground rhizome. They may all be propagated either by divisions of the rhizome or by sowing the spores. *P. cretica* will come up freely from self-sown spores in the greenhouse, as will *P. longifolia* in a warmer house. These two, in fact, come up so freely in the pots of other ferns that they are considered a nuisance in some establishments.

Description of Plates 308 and 309. Plate 308. *Pteris quadriaurita*, var. *argyræa*; frond natural size. Under side of pinna, showing sori in position.

Plate 309. *Pteris serrulata*, the Spider Fern; single frond, natural size. Fig. 1, portion of fertile pinna, enlarged, showing sori.

MAIDENHAIR FERNS

Natural Order Filices. Genus *Adiantum*

Adiantum (the old Greek name, from *adiantos*, dry, from the fact that water rolls off the fronds without wetting them). A genus of about eighty species of stove and greenhouse Ferns, with tufted or creeping root-stocks, and usually compound fronds, these being twice, thrice, or four times pinnate. The rachis and its branchlets are hair-like, whence the popular name of these plants. There is considerable variety in the general form of the fronds and of their parts, but as a rule the pinnules are wedge-shaped, or rounded or lunate. This gives the plants a character that distinguishes them at a glance from other ferns. The sori are marginal, as in *Pteris*, rounded, or oblong. The involucre consists of the turned-down margin of the pinnule, to which the sori is attached, so that it appears to open inwards. They are found in all Tropical and Temperate Regions, but the headquarters may be said to be Tropical America.

History. *The* Maidenhair Fern, *Adiantum Capillus-Veneris*, which is widely distributed in the warmer portions of both Old and New Worlds, is the only one of the genus that has extended its range across the Channel from Europe to the westerly portions of these islands. In the humid atmosphere of sea-caves and wet rocks, from Dorset to Cornwall, in Glamorgan, in Man and the West of Ireland this Fern is occasionally found; though more rarely every year. This, probably, was not a cultivated plant until comparatively recently, for, far from the sea, it would not grow out of doors. *A. pedatum*, however, which came from North America prior to 1640, is a more hardy subject. It was introduced by the younger Tradescant, and was growing in the famous garden at Lambeth two hundred and fifty-seven years ago. *A. reniforme*, from Madeira and Teneriffe, was also introduced during the 17th century, for in 1699 Bobart had it growing at Oxford. We ceased introducing Maiden-hairs then for nearly a hundred years; but the importation of *A. villosum* from Jamaica, in 1775, seemed to draw attention to the West Indies as a source for new species, for in 1793 we brought thence *A. macrophyllum*, *A. pulverulentum*, *A. tenerum*, and *A. trapeziforme*. *A. cuneatum*, which is the one most commonly cultivated, came from Brazil in 1820, in which year we got *A. formosum* from Australia; whence also came *A. hispidulum*, in 1822; and *A. æthiopicum*, in 1823. Among more

MAIDENHAIR

(ADIANTUM CUNEATUM)

Nat. size

PL. 310

recent introductions we may mention *A. curvatum*, from Tropical America, in 1841. In the year 1865 some Ferns were received for exhibition from Mr. T. G. Briggs, of Farley Hill, Barbados, and among them was a magnificent variety, which for some years caused Fern-growers to have doubts and perplexities regarding its origin and status. It was provisionally called *Farleyense*, in honour of its place of origin, and it was variously thought to be a sport of *A. tenerum*, a hybrid between that species and *A. trapeziforme*, and a distinct species. It is now given rank as a variety of *A. tenerum*, and is acknowledged as one of the most magnificent of the genus. *A. rubellum* was introduced from Bolivia in 1868; and *A. Williamsii*, from the Andes of Peru, in 1877.

Principal Species.

ADIANTUM ÆTHIOPICUM (Ethiopian). Stipes slender, erect, 6 to 9 inches long. Fronds triangular, three or four times pinnate; pinnæ triangular; pinnules half-round, the upper part broadly lobed. Sori in roundish patches. There are several geographical varieties of this widely-distributed species. Stove.

A. CAPILLUS-VENERIS (Venus' Hair). Rootstock creeping. Stipes slender, half-erect, black, polished, 4 to 9 inches long. Frond 4 to 12 inches long, oval, with many spreading, hair-like branches. Pinnules thin, fan-shaped, but varying considerably; the upper edge deeply lobed, and segments round-toothed. Sori between the round teeth, covered by a somewhat kidney-shaped involucre. Greenhouse. There are numerous varieties.

A. CAUDATUM (tailed). Stipes 2 to 4 inches long, wiry, tufted. Fronds 6 to 12 inches long, pinnate, rachis often extended beyond pinnæ, and the tip rooting. Pinnæ oblique; the upper edge rounded and cut: hairy on both sides. Sori roundish or oblong. Native of the Tropics generally. Stove or warm greenhouse.

A. CUNEATUM (wedge-shaped). Stipes 6 to 9 inches long, slender, erect. Fronds 9 to 18 inches long, wedge-shaped, three or four times pinnate. Lower pinnæ 4 to 6 inches long; pinnules wedge-shaped, deeply-lobed at top. Sori four to six, kidney-shaped. Greenhouse or stove. The most popular of the Maidenhair Ferns. Plate 310. There are a great number of garden varieties, among the more important being *dissectum*, *mundulum*, *Legrandi*, and *Pacotti*.

A. EDGWORTHII (Edgworth's). This is very similar to *A. caudatum*, from which it differs by reason of its thinner, more membranous texture, its surfaces devoid of hairs, and its upper margin being scarcely lobed. Native of China and Himalaya. Stove.

A. FORMOSUM (beautiful). Stipes 12 to 18 inches long, erect. Fronds 1½ to 2 feet long, 1 to 1½ foot across, two, three, or four times

pinnate. Lower pinnæ 12 to 18 inches long, wedge-shaped; pinnules wedge-shaped. Sori numerous, somewhat kidney-shaped. Greenhouse.

A. GLAUCOPHYLLUM (glaucous-leaved). Similar to *A. cuneatum*, except that it is one-third larger in all respects, and that the under side is of a glaucous hue. A Mexican plant. Greenhouse.

A. HISPIDULUM (somewhat bristly). Stipes erect, 6 to 15 inches long. Fronds forking, each division being fan-shaped. Pinnæ 6 to 9 inches long. Pinnules oblique; outer edge bluntly rounded, finely toothed; upper margin also finely toothed. Sori numerous and continuous, roundish. Greenhouse.

A. MACROPHYLLUM (large-leaved). Stipes 6 to 12 inches long, erect, nearly black. Fronds 9 to 15 inches long, 4 to 8 inches broad, pinnate. Lower pinnæ, 3 or 4 inches long, the base overlapping the rachis; margin deeply lobed. Sori in marginal lines, continuous or interrupted. Stove.

A. PEDATUM (footed). Stipes 1 to 2 feet long, erect, polished. Frond fan-shaped, the rachis dividing into two main branches, which are each recurved, and bear on the outside of the curve a number of nearly straight, pinnate branchlets. The largest of these pinnæ are 6 to 12 inches long, with about thirty pairs of one-sided, oblong pinnules, whose upper margin is lobed and bears the roundish sori. Hardy.

A. RENIFORME (kidney-shaped). Stipes tufted, 4 to 9 inches long. Fronds kidney-shaped, undivided, 2 to 4 inches across. Sori all around the margin, $\frac{1}{8}$ to $\frac{1}{4}$ inch broad. Greenhouse.

A. RUBELLUM (reddish). Stipes 4 to 6 inches long. Fronds wedge-shaped, 4 to 6 inches long, twice pinnate, purplish crimson when young, changing to green with a pinkish tinge. Sori round, in the lobes of pinnules. Greenhouse.

A. TENERUM (tender). Stipes erect, 1 foot long. Fronds 1 to 3 feet long, 9 to 18 inches broad, wedge-shaped; three or four times pinnate. Pinnules stalked, wedge-shaped to rhomboid, upper edge deeply lobed. Sori roundish in the lobes of upper pinnules. Stove. There are several varieties, of which *Farleyense* is exceedingly popular; other good varieties are *Lathomii*, *scutum*, and *Victoriæ*.

A. TRAPEZIFORME (rhomb-shaped). Stipes 6 to 12 inches long, erect. Fronds 1 to 2 feet long, with a central pinna 4 to 6 inches long, and on each side two to four large, spreading ones, the lowest of which are often branched again. Pinnules oblique, the sides nearly parallel. Sori numerous, round upper and outer edges. Stove. Plate 311.

A. WILLIAMSII (Williams'). Stipes 6 to 8 inches long. Fronds triangular, 9 to 18 inches long, thrice pinnate; when young, dusted with

ADIANTUM TRAPEZIFORME

Nat. size

PL. 311

a yellow mealiness. Pinnæ distant, oval, with somewhat rhomboidal pinnules, whose edges are ragged, except the outer, which is occupied by the kidney-shaped sori. Greenhouse.

Cultivation. The general directions already given for Fern-culture still apply. The soil most suitable to the majority of *Adiantums* is a compost of fibrous peat, loam, and sand. For the more delicate sorts the peat should be to the loam in the proportion of two to one; the stronger-growing will require the proportions reversed; whilst to those of average robustness equal quantities may be used. They should not be stinted for pot room, and particular attention should be paid to drainage. *A. tenerum*, var. *Furleyense*, will be found specially fine for a large, hanging basket in a warm, moist atmosphere, when its large, beautiful fronds will show to the greatest advantage. *A. caudatum* and *A. concinnum* are also good subjects for such treatment. *A. pedatum* may be grown on outdoor ferneries in most places. Propagation is effected by dividing the rootstocks and by raising young plants from the spores.

Description of Plates 310 and 311. Plate 310. *Adiantum cuneatum*, the Maidenhair Fern, natural size. Fig. 1 is an enlarged view of the prothallus and the first frond; 2, a pinnule enlarged, under surface, showing involucres; 3 is a still greater enlargement of one of the lobes of a pinnule, showing the sori under the involucre.

Plate 311. *Adiantum trapeziforme*. A frond, natural size, but the rachis doubled over to get it in the space. Fig. 1 shows the under side of a pinnule, with the sori and involucres along the upper edges; 2 is an enlarged view of a sorus and its involucre.

GOLD AND SILVER FERNS

Natural Order Filices. Genus *Gymnogramme*

Gymnogramme (Greek, *gymnos*, bare, and *gramme*, a line: from the form of the sori, which spread in irregular lines, and are not covered by any involucre). A genus of about a hundred species of Ferns, mostly stove subjects, with fronds of diverse habit, once, twice, or thrice pinnate. The sori are oblong, united into narrow irregular lines. They are situated on or between the veins, on the under surface of the frond. The involucre is not present in any of the genus. The species are distributed chiefly over the warm regions of the Globe, one extending into the British Islands as far as Jersey.

History. There are very few Ferns known that are only annual in duration, and the present genus has the distinction of including two of these. The spores of these two—*Gymnogramme chærophylla* and *G. leptophylla*—germinate with what, among Ferns, must be characterised as precipitous haste; for those shed in summer have produced plants by autumn which are full-grown the next spring, and perish in summer. The genus is best known in gardens through *G. calomelanos*, a Tropical American species, which was introduced from the West Indies in 1790. In the normal form this species has the under surface sprinkled with white powder, which imparts a silvery appearance, and, of course, led to the plant being called Silver Fern. Several other species share this character. In 1793 *G. rufa* was introduced from Jamaica. As a contrast to *G. calomelanos*, there was introduced, also from Jamaica, in 1808, a yellow-dusted species, *G. sulphurea*. *G. trifoliata* (Jamaica, 1810) has both white- and yellow-backed fronds; *G. tartarea* (1817), dense white powder. In 1824 a yellow-backed form was introduced, and long known as *G. chrysophylla*, but now ranks as a variety of *G. calomelanos*. Among the more recently-introduced species we may mention *G. japonica*, from Japan, 1863; *G. Pearcei*, from Peru, 1864; *G. triangularis*, from Vancouver Island, 1874; and *G. schizophylla*, from Jamaica, 1880.

Principal Species. GYMNOGRAMME CALOMELANOS (beautiful black). Stipes tufted, 6 to 12 inches long. Fronds 1 to 3 feet long, 6 to 12 inches across base. Pinnæ lance-shaped, the lowest pair much larger than the others; the lowest pinnules almost again pinnate. Powdered white. The var. *peruviana* is smaller than the type; fronds 12 to 16 inches long; stipes and rachis chestnut-brown. The var. *chrysophylla*, represented on Plate 312, is similar to the var. *peruviana*, but the rachis is darker in colour, and the powder is golden-yellow. This is usually known as *G. chrysophylla*, as printed beneath the plate; but its correct designation is *G. calomelanos*, var. *chrysophylla*. Stove.

G. JAPONICA (Japanese). Rootstock creeping. Stipes 6 to 12 inches long. Fronds 1½ to 2 feet long, a foot across, pinnate: lowest pinnæ again pinnate. Pinnæ 6 to 12 inches long, entire. Stove.

G. LEPTOPHYLLA (slender-leaved). Annual Silver Fern. Stipes 1 to 4 inches long. Frond slender, 1 to 3 inches long, oblong-oval, twice or thrice pinnate, smooth. Pinnules oval, wedge-shaped, with two or three blunt lobes; annual. **Hardy.**

G. PEARCEI (Pearce's). Stipes 6 to 9 inches long. Fronds triangular, 1 foot either way, four times pinnately cut (*quadripinnatifid*). Lower pinnæ 4 to 6 inches long; pinnules overlapping. Powdered white. Stove.

GOLD FERN

(GYMNOGRAMME CALOMELANOS, *var. laucheana*)

$^{2}/_{3}$ Nat. size

PL. 312

G. SCHIZOPHYLLA (cut-leaved). Stipes tufted, slender, 6 inches. Fronds 1½ to 2 feet long, very finely and intricately cut into numerous minute pinnules. Stove.

G. SULPHUREA (sulphur-coloured). Stipes tufted, 1 to 6 inches long, upper part powdered. Fronds thrice pinnatifid, 6 to 12 inches long, 3 to 4 inches across. Pinnules cut fan-like. Powdered bright yellow. Stove.

G. TARTAREA (infernal). Stipes tufted, 6 to 12 inches long. Fronds 1 to 2 feet long, 6 to 12 across, oblong-triangular; twice pinnate. Pinnæ lance-shaped, the lowest largest. Pinnules blunt, entire or nearly so. Powdered pure white.

G. TRIANGULARIS (triangular). Stipes tufted, 6 to 12 inches long. Fronds triangular, 3 or 4 inches either way. Lowest pinnæ the largest, triangular; upper lance-shaped, pinnately cut. Powder of variable hue, from deep orange to white. Stove.

Cultivation. All the species of *Gymnogramme* do well in a compost of fibrous peat and sand, well drained, as they require plenty of water whilst growing. The fronds should never be syringed, as the water gathers in the powder and soon spoils their appearance. They require a sunny position if grown under glass. *G. schizophylla* is a beautiful basket plant. *G. leptophylla*, when once established in a fernery, annually reproduces itself from self-sown spores. The others may be propagated by dividing the rootstocks and by sowing the spores. Some of them have proliferous fronds.

Description of Plate 312. *Gymnogramme calomelanos*, var. *chrysophylla*, Gold Fern. Both sides of a small frond are shown.

HARE'S-FOOT FERNS

Natural Order FILICES. Genus *Davallia*

DAVALLIA (named in honour of Edmund Davall, a Swiss botanist). A genus of about a hundred species of greenhouse Ferns with creeping, scaly rhizomes, fronds of varied form, and marginal or roundish sori, with a scale-like involucre attached by a broad base and sides. The species are widely distributed, and most are evergreen, which renders the fronds valuable for cutting. *D. canariensis*, the Hare's-foot Fern, is the best known; it has been in cultivation here since 1699. Its rhizome is densely clothed in brown hair-like scales, and as it creeps over the rim of the pot it presents a wonderful likeness to the foot of a hare.

Principal Species.

DAVALLIA BULLATA (blistered). Squirrel's-foot Fern. Rhizome stout, clothed with hair-like scales. Stipes stout, erect, 3 to 4 inches long. Fronds 8 to 12 inches long, 4 to 8 inches across, triangular, four times pinnate. Lower pinnæ lance-shaped, with somewhat rhomboid segments. Sori half-cup-shaped. Native of Tropical Asia. Not evergreen. Stove.

D. CANARIENSIS (Canary Islands). Rhizome creeping, densely scaly. Stipes erect, 4 to 6 inches long. Fronds 1 to 1½ foot long, 9 to 12 inches across, triangular. Lower pinnæ lance-shaped-triangular, with more oval segments. Sori, each occupying an entire lobe of a pinnule. Evergreen. Native of Europe and the Canaries. Greenhouse.

D. DISSECTA (dissected). Similar to *D. bullata*, but much larger, and evergreen. The rhizome is of climbing habit. The sori are minute, oblong. Introduced from Java, 1855.

Cultivation.

Davallias should be grown in fibrous peat and sand, which should be piled up above the rim of the pot. The rhizome should not be covered with soil, but simply pressed in, and, if necessary, slightly pegged down until its roots are established. Those of climbing habit should have the growing point of the rhizome placed against a length of Virgin Cork, the old trunk of a Tree Fern, or similar body, to which it will attach itself. They are also suitable for basket-culture.

DICKSONIAS

Natural Order FILICES. Genus *Dicksonia*

DICKSONIA (named in honour of James Dickson, a cryptogamic botanist). A genus of about forty species of stove and greenhouse Ferns, chiefly natives of Tropical America and Polynesia. Many of the species are Tree Ferns, with tall stems and large, leathery, much-divided fronds. The sori are situated near the margin of the frond and at the extremity of a vein; the involucre is cup-shaped or two-valved.

History.

Dicksonia arborescens was the first species of this genus to be introduced to cultivation in this country, coming from St. Helena in 1786; but another species had long been known to fame, and appeared to furnish conclusive evidence of the truth of one of the most cherished of travellers' tales. This was *D. Barometz*, a plant with creeping rhizome densely clad in silky hair-like scales similar to that of *Davallia canariensis*, and the story founded upon it was to the effect that, in the deserts of Scythia, there grows a plant

resembling a lamb, with feet, head, and tail distinctly formed, and its skin covered with soft down. This little lamb grows upon a stem, from which it bends down to crop the grass around it. Specimens were brought to this country testifying to the truth of this story, and one of these is still to be seen in the British Museum, where it has been for more than a hundred years. As a matter of fact, it is part of the creeping rhizome, with the basal portions of four stipes cut to equal length to serve as legs, and, when inverted, this has a very lamb-like aspect. It was not until the year 1725 that the story was "blown upon" by Dr. Breyne, of Dantzig, who published a true account of it. *D. Barometz*, in the living state, was introduced from China in 1824. *D. antarctica*, a Tree Fern, was also introduced in 1824 from Australia.

Principal Species.

DICKSONIA ANTARCTICA (Antarctic). Trunk 30 feet high, 1 to 2 feet diameter. Stipes 1 foot long, scaly. Fronds 6 to 9 feet long, rhomb-shaped, thrice pinnate. Pinnæ 1 to 2 feet long; pinnules narrow, $\frac{1}{2}$ inch wide, divided into oblong segments. Greenhouse.

D. SQUARROSA (rough). Stem erect and slender, rough, with the bases of stipes of the fallen fronds. Stipes 6 to 12 inches long, rough, with dense scales. Fronds oblong-triangular, thrice pinnate, spreading. Pinnæ lance-shaped. Pinnules slender, with lance-shaped segments. Native of New Zealand. Greenhouse.

Cultivation.

A mixture of two parts peat to one of loam, and sufficient sand to keep the whole open, will be found most suitable for these plants. A liberal supply of water should be given, not only to the roots, but the stem should be syringed frequently. They should be grown in pots or tubs, and may be placed outside during the warm summer months.

THE END.

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